The Theory of Optimum Currency Areas: The Euro Area and The Recent Crises

by

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Biographic Note | Nota Biográfica

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Abstract

This dissertation analyses the Euro Area in light of the Theory of Optimum Currency Areas (OCA), aiming to draw some conclusions about whether the Euro Area is currently closer or farther from the concept of an OCA than it was before the recent shocks it has endured, namely, the 2008 global financial crisis and the 2010 sovereign debt crisis. We use a descriptive analysis of five criteria suggested by the OCA theory, during two distinct periods: 1999-2007 and 2008-2016. While we find some countries' experiences to stand out, our findings appear to indicate an overall convergence of the Euro Area in the second period. Thus, after having experienced two consecutive crises, overall, the Euro Area does not appear to be farther from an OCA, with some indicators suggesting a tendency for it to become closer.

JEL-codes: E32, F15, F33, F45

Key-words: Optimum Currency Areas (OCA), European Economic and Monetary Union (EMU), Euro Crisis, Sovereign Debt Crisis

Resumo

Esta dissertação analisa a Área do Euro à luz da Teoria das Zonas Monetárias Ótimas (ZMO), tentando retirar algumas conclusões face ao seu atual posicionamento enquanto ZMO, tendo em conta a recente sucessão de crises, nomeadamente, a crise financeira global de 2008 e a crise de dívida soberana de 2010. Para isso realizou-se uma análise descritiva de 5 critérios sugeridos pela teoria, a ser aplicada a dois períodos distintos: 1999-2007 e 2008-2016. Apesar do destaque de alguns países, os resultados parecem indicar, no geral, uma convergência no segundo período. Deste modo, mesmo após a recente sucessão de crises, a Área do Euro não aparenta estar mais distante do conceito de ZMO, com alguns indicadores sugerindo uma possível aproximação.

Códigos-JEL: E32, F15, F33, F45

Palavras-chave: Zonas Monetárias Ótimas, Crise da Zona Euro, Crise da Dívida Soberana, União Económica e Monetária Europeia

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Introduction

Bearing in mind the recent shocks that hit the Euro Area, namely the 2008 global financial crisis and the 2010 sovereign debt crisis, this dissertation makes an empirical assessment of the Euro Area in light of the Theory of Optimum Currency Areas (OCA), aiming to draw some conclusions about whether the Euro Area is currently closer or farther from the concept of an OCA.

The European Union (EU) has been through some metamorphoses since the beginning. With the creation of the Single European Market, a monetary union seemed like the next step to take and in 1999 the Euro Area was created. Although having a brief history as a monetary union, especially when comparing with the United States (US), the Euro Area has already been put to the test. The recent succession of crises, which started in 2007 with the *subprime* crisis in the United States, made bare fragilities and asymmetries among countries comprising the Euro Area and made the Theory of OCA a much discussed topic among academics, especially when we keep in mind that economic turbulence can impact the main OCA criteria (*e.g.*, the evolution of business cycles or trade patterns). The policy responses taken are also very important, especially when one considers that the monetary policy cannot be used individually to respond to those shocks.

Therefore, in this context, it is relevant to analyse the experience of the Euro Area, in light of the OCA theory, in order to assess how well the European Economic and Monetary Union (EMU) fairs regarding these criteria. Moreover, the rise of some elements of Euroscepticism and whether they can or cannot be justified, reinforces this need to investigate whether the Euro Area is closer or farther from the concept of an OCA. We also extend our analysis to the other EU members, allowing for comparisons with Euro Area members and to consider the possibility of Euro Area enlargements.

Accordingly, the main objectives of this dissertation are: 1) to analyse the Euro Area regarding multiple OCA criteria; 2) to extend this analysis to the other EU members; 3) to compare the performance of Euro Area members and non-members in light of those criteria; 4) to make these analyses for two distinct sub-periods, considering the recent crises experience.

Regarding time periods, we analyse two periods: pre and post 2008. Hence, our first period comprises 1999 through 2007 and our second period comprises 2008-2016. We chose these two periods in order to analyse the performance since the launch of the Euro Area until the global crisis and also to confine the effects of both crises to only one period. The second period is marked not only by the 2008 global financial crisis, but also by the 2010 sovereign debt crisis.

Concerning methodology, we will use a descriptive analysis. This methodology has been used by several empirical studies aiming to assess monetary unions using the OCA framework (*e.g.*, Loureiro *et al.*, 2012 and Quah, 2016). We will analyse the Euro Area experience, in light of the OCA theory, using 5 indicators: inflation differentials, trade integration, export diversification, business cycles synchronisation and labour mobility.

As it was already pointed out, the OCA theory is a much discussed topic, and by applying it to the Euro Area and see how it fares one can take away important lessons for the conduct of economic policy. The main contribution of this dissertation will be of an empirical nature, by assessing whether the Euro Area has become closer or farther from the concept of an OCA, during the length of its existence. Our empirical analysis has the particularity of being implemented for two different time periods, with one of them being more economically turbulent than the other. We also contribute with the study of the remaining EU members, in order to compare this group's performance with the Euro Area, and analyse whether they are closer to a possible accession. To the best of our knowledge, this is the first study to use this methodology for these time periods and sample countries, in order to analyse the Euro Area stance as an OCA.

This dissertation is structured as follows. In chapter 1) we briefly review the literature on OCA theory. In chapter 2) we analyse the experience of different monetary unions. In chapter 3) we briefly review frequently used methodologies and discuss the one we will be using. In chapter 4) we assess the Euro Area as an OCA and the possible accession of the remaining EU members. We finish with some concluding remarks.

Chapter 1. The Theory of Optimum Currency Areas

In this chapter we will briefly review the literature on the OCA theory.[1] In section 1.1) we analyse key OCA criteria and in section 1.2) we analyse the "endogeneity hypothesis". A key concept of this dissertation is the notion of optimum currency area. Mundell (1961) was the pioneer of the theory (Fleming, 1971). Mongelli (2008, p.2) has provided the following definition: "*An optimum currency area (OCA) can be defined as the optimal geographical area for a single currency, or for several currencies, whose exchange rates are irrevocably pegged. The single currency, or the pegged currencies, fluctuate jointly vis-à-vis other currencies.*"

1.1 The Traditional Approach and the Cost-Benefit Analysis

As mentioned before, Mundell (1961) was the pioneer of the OCA theory (Fleming, 1971). Mundell (1961) proposed that there could be a lot of potential for certain regions to come together and form a currency area whereby the different exchange rates are pegged. This contribution aimed at defining the optimum domain of that area. When one has a flexible exchange rate, one can use it to correct balance of payments disequilibria, by devaluing the currency. However, when a country has a fixed exchange rate regime, it loses the exchange rate policy as an adjustment instrument.

There is another way to correct these disequilibria, which is by having price flexibility and labour mobility. Mundell (1961) presents a model to elaborate this view. Consider two countries, A and B, both with full employment and balance of payments equilibrium in their initial state. In the short run there is price and wage rigidity. Consider also that, in this first scenario, each entity has its own currency and the monetary authority aims to prevent inflation. First, imagine that country B suffers a demand shock, with the

[1]For surveys of this literature, please see Ishyama (1975), Mongelli (2005 and 2008), De Grauwe (2012) and Masini (2014).

consumers in B redirecting their demand towards products produced by country A. This will cause inflationary pressures in A and the rise of unemployment and reduction of output in B. These effects will be more or less prominent in each of the entities depending on A's willingness to help B support the burden of adjustment. Given the monetary authorities' concern with inflation, A will not let the price level rise. Hence, if A will not let prices rise and if B cannot lower them, the adjustment will be made through the reduction of employment and output in country B.

Consider now, a second scenario, in which both countries share a currency and a central bank, whose objective now is full employment. Imagine again that country B suffers a demand shock which causes the demand to shift towards A-produced goods. The same effects are in order, country A suffers inflationary pressures and country B is faced with a rise in unemployment. The central bank will try to minimize unemployment with an expansionary monetary policy, but this will happen at the expense of inflation in country A.

Mundell (1961) concludes that, when the region one is considering has multiple currencies, unemployment in deficit countries is dependent on the willingness of surplus countries to help with easing the adjustment, by allowing inflation to prevail. On the other hand, when the region shares a currency, inflation will depend on the level of unemployment that the central bank is willing to accept.

The existence of more than one currency area implies that those areas should be linked through a system of flexible exchange rates (Mundell, 1961). However, if one region of production is extended to more than one currency area, and that region suffers an asymmetric shock, the movement of flexible exchange rates will do little to correct the disequilibria. Nevertheless, if national currencies were to be abandoned in favour of regional currencies, the actions of the flexible exchange rates could correct possible balance of payments disequilibria, thus assuring price stability and employment.

To define the optimum region, Mundell (1961) took into consideration the Ricardian principle about factor mobility. If there is high internal factor mobility and low international factor mobility, then a system of flexible exchange rates between regions will work properly. Given this conclusion, this study states that for this rearrangement of

currencies to happen, political change is also needed, which at the time seemed possible in the ex-colonies and Western Europe.

Mundell (1961) also argues that, keeping in mind only the argument of stability, the larger the number of currency areas the better; yet when one looks at the costs, having too many currencies might cause money to lose its utility and one would arrive at a situation no better than barter.

Kenen (1969) criticizes Mundell's (1961) criterion arguing that migration might have some flaws, especially if there are different labour intensities in both regions. Moreover, one cannot really be sure if migration can restore a perfect balance in both regions, even if it has resolved unemployment issues. Labour has to have similar skills to move between the two regions, which leads to the conclusion that the optimum currency area needs to be small. Ishiyama (1975) also points out that beyond the real costs associated with migration, there are also psychological costs associated with the adjustment to a different environment and culture. Ishiyama (1975) also criticises Mundell's (1961) lack of distinction between capital mobility and labour mobility.

The seminal papers of McKinnon (1963) and Kenen (1969) have also made important contributions. While McKinnon (1963) suggests openness of the economy as another criterion, Kenen (1969) focuses on the diversification of production.

McKinnon (1963) tries to develop even more the concept of optimality, considering the influence of an economy's trade openness. In order to do so, McKinnon (1963) relies on the ratio of tradable to non-tradable goods, where tradable goods refer to those which can be traded outside the home country and non-tradable goods refer to those which cannot, because it is not feasible to transport them.

To further explore the role of the openness of the economy as criterion for the OCA theory, McKinnon (1963) uses a model to assess what is the best way to assure external balance, either by external exchange rate flexibility or by the use of internal fiscal or monetary policies. It is important to point out that the area under analysis does not have the ability to affect external prices. If an economy has a large tradable goods sector, it is better off if it uses fiscal policy to assure external stability and to shield itself from speculative movements. As an economy becomes increasingly open, flexible exchange

rates become less effective in assuring external stability and can even cause problems to internal price level stability. However, when an economy has a large non-tradable sector, fiscal/monetary policy may not be successful as an external stability mechanism because it will cause more unemployment in that sector. If there is mobility rigidity between both sectors the adjustment will be slower.

For Kenen (1969), defining an optimum currency area by perfect labour mobility is not the best approach. Instead, Kenen (1969) advocates that a diversified production structure is more relevant. A well-diversified economy can export a wider range of products, and even though they are still susceptible to shocks, those will even out eventually, which makes it a more stable economy when compared to those with less diversification. This also means that a diversified economy will not need to change its terms of trade as often. Regarding employment, when the diversified economy faces a demand shock, unemployment will not rise as sharply. Regarding investment, capital formation will not have huge variations. If there is a need to invest in one exporting product that does not necessarily mean that investment will decrease in other exporting products.

Kenen (1969) also suggests that fiscal and monetary policies should be applied to the same domain, which would mean that the whole currency area would be under the same, cohesive fiscal domain. The currency area would need to be comprised of multiple single-product regions, but with an efficient fiscal system which contributed to internal stability. Kenen (1969) acknowledges fixed exchange rates to be better for well diversified-economies as long as they possess the necessary internal policies to deal with the unemployment that might rise due to exports fluctuations and imperfect mobility of labour.

As discussed above, each of these authors suggested the criterion they acknowledged as the best in defining an optimum currency area, having each one of them to be applied singularly. This is one of the reasons why the traditionalist view on the theory is criticized, because of the need to choose only one criterion to define the optimum currency area (Fleming, 1971; Ishiyama, 1975).

Fleming (1971) was the first to suggest a cost-benefit analysis for the decision to join or to form an area with fixed exchange rates or a common currency. To the criteria

suggested by the previous three authors, Fleming (1971) drew attention to the role of money illusion in wage determination, the degree of economic policy integration, and moreover, the similarity of rates of inflation.

This last criterion holds great importance because the more similar the rates of inflation of countries aiming to participate in a fixed exchange rate area, there is less need for them to sacrifice their preferred points in the Phillips curve. However, there will always be some negative implications for the unemployment-inflation relationship, even if it does not necessarily mean the deterioration of both (Fleming, 1971). Ishiyama (1975) supports this criterion since it shifts attention towards macroeconomic phenomena and considers that its significance depends on the role played both by rates of inflation and productivity growth on payments disequilibria. Fleming (1971) also refers to the need for fiscal transfers between participants to be made easier.

Like Fleming (1971), Ishiyama (1975) also criticises the single criterion approach, acknowledging the cost-benefit analysis as better and superior, since it compares the negative and positive effects of creating a fixed exchange rate area. Nonetheless, Ishiyama (1975) recognizes the difficulty in such endeavour, especially if there are interdependencies between them. The benefits of having a common currency are the elimination of conversion costs, the reduction and eventual elimination of speculative capital flows and, as suggested by Mundell (1973), savings on exchange reserves. Regarding costs, Ishiyama (1975) acknowledges the loss of monetary policy autonomy, the effects on the unemployment-inflation relationship and possible worsening of economic conditions for certain unprepared regions. Mundell (1973) listed additional benefits of a common currency such as the need to hold fewer reserves, the sharing of shocks, either positive or negative, the sharing of risk fluctuations and the ability to distribute them through time, thus easing the burden.

1.2 The Endogeneity of the OCA Criteria

Mélitz (1995) criticised the lack of progress that had been made since Mundell (1961). Mélitz (1995) urged the creation of a unifying framework that could address the

theory and policy aspects. In the following years, a new advancement in the theory was about to be made. The literature on this topic started to shift its focus to "meta-properties" and the possibility of an "endogeneity of OCA". The credit for this breakthrough goes to Frankel and Rose (1998) (De Grauwe and Mongelli, 2005).

Frankel and Rose (1998) studied the correlation of intensity of trade among countries with the synchronisation of business cycles and found that there is a positive and strong relation between the two, which would mean that even if a country is not suitable for entering a currency union, it might reveal positive effects after entrance. As Frankel and Rose (1998) have said, "(...) a country is more likely to satisfy the criteria for entry into a currency union *ex-post* than *ex-ante*" (p. 1024).

Alesina *et. al* (2002) agreed, considering that the application of the theory prior to joining a currency area might underestimate potential benefits. Likewise, De Grauwe and Mongelli (2005) also examine the endogenous effects of participation in a common currency in four areas, namely, economic integration, financial integration, symmetry of shocks and product and labour market flexibility.

All of these authors mentioned above were of the same opinion that the creation of a common currency in Europe would be able to reap the benefits of endogeneity, since "(...) the euro area may turn into an optimum currency area (OCA) after the launch of the monetary integration even if it wasn't an OCA before (...)" (De Grauwe and Mongelli 2005, p. 7).

Krugman (1993), however, argued that Europe may experience regional specialisation similar to what happened in the US. There are US regions which are very specialised and, therefore, more susceptible to asymmetric shocks. Not having access to exchange rate policy, or regional-level monetary policy, those regions would have to resort to fiscal policy, or rely on emigration to lower unemployment. This work also argues that the fostering of economic integration would lead to increased regional specialisation, making regional exports more susceptible to shocks. The cost of such shocks would be even greater without a mechanism similar to the US-style fiscal federalism.

Chapter 2. Currency Areas in Practice

2.1 The European Economic and Monetary Union

2.1.1 The Road to the Euro

When a few European countries decided to form a community to help them prosper and grow together, they could not possibly have in mind all that would happen in the following decades. The Community kept on growing and to strengthen their relationship, especially after the creation of the Single European Market, a plan for an European currency started to be drawn. The road to the Euro was a long one that started several years prior to the actual circulation of the currency itself. Commissions were held, which provided reports that shed some guidance and eventually led to the Maastricht Treaty (Mongelli, 2008). One of the most relevant, at least regarding the theory, was the "One Market, One Money" report by Emerson *et al.* (1990). Although it considered the OCA theory as being unable to provide a satisfactory framework for analysing the creation of the EMU, it was able to spark a revived interest in the theory and new literature started to emerge (Mongelli, 2008).

Emerson *et al.* (1990) illustrated the benefits and the costs of a common European currency. The EMU would contribute to foster microeconomic efficiency, because a common currency complements the single market; foster macroeconomic stability, with less fluctuation in output and unemployment; and raise fairness among participating members. The benefits acknowledged were efficiency gains with the elimination of exchange rate uncertainty as well as transaction costs; price stability resulting from a reputational gain of low inflation; ameliorate public finances by granting autonomy to respond to country-specific shocks, rules to avoid excessive deficits and policy-mix coordination; savings in external reserves and even possibly some seigniorage gains. The main costs identified were the loss of the exchange rate adjustment instrument and the loss of monetary independence. However, Emerson *et al.* (1990) acknowledged the EMU

would reduce country-specific shocks and that fiscal policy, at both national and community levels, would also help with shock absorption.

Ever since the possibility of forming a currency union in Europe was considered that there have been numerous studies assessing it. The OCA theory was rendered outdated and incapable of offering a framework to assess the European endeavour (Emerson *et al*., 1990). The convergence criteria were nominal and the possibility of endogeneity started to be explored as a justification for continuing the project (Wagner, 2014).

Nevertheless, other studies, advised caution in undertaking such a daring project. Among the most prominent we find Bayoumi and Eichengreen (1997). This work developed an "OCA index" to measure how the European countries would fair with a common currency. The countries were divided into three groups: those that were ready to form a currency area, those that were converging and those that had shown little convergence. France did not enter the first group, which led the authors to conclude that the French desire of participating in a common currency was motivated by politics. In another work, Bayoumi and Eichengreen (1992) noted that the EU suffered more asymmetric shocks than the US and that they were slower to adjust. This meant that the EU might have a harder time in operating a currency area.

Bayoumi and Prasad (1997) investigated the causes of shocks to output and the role of the labour market as an adjustment mechanism in the US and the EU. The importance of different types of shocks seemed to be similar for both economic regions. However, looking at the sectorial level, the authors found that in the US, disturbances seemed to occur more in the non-traded goods sector, whilst the EU seemed to be more affected by disturbances in the traded goods sector. Nevertheless, the impact of those disturbances in the EU had apparently been diminishing since the 1980s, which might be explained by the European desire for further integration (Bayoumi and Prasad, 1997). This study also found that, when it comes to labour markets as adjustment mechanisms, these two economic areas displayed some differences. The US labour market was more integrated than Europe's which made it a more reliable adjustment mechanism (the authors also noted that part of this could also be explained due to the existence of a single

currency in the US). According to the authors, if this low labour mobility situation persists after EMU, Europe might have to deal with large wage differentials.

Gros (1996) also studied labour mobility as an adjustment mechanism to shocks in the EU. More precisely, this study analysed how shocks to exports affected unemployment in the past and concluded that they have not been determinant. Therefore, if one were to expect shocks to exports to have some impact on unemployment in the future, these would have to be larger than before. Moreover, the author also argues that the degree of labour mobility is not as important as may have been previously thought, since what was important was the difference between labour mobility between countries comprising the currency area, and labour mobility between these and other countries. In other words, labour has to be more mobile within the region than between the region and the rest of the world. Therefore, labour mobility can act as an adjustment mechanism so long as migrants do not show preference for the country they decide to move to, as long as it is a member of the currency area. One of the reforms that could help foster labour mobility is making the housing market more flexible (Gros 1996).

2.1.2 Early Years and Early Experience

Even if the OCA theory would advise caution, the European monetary project continued to take its steps because, according to Krugman (2012), European leaders' "(...) had their hearts set on a single currency" (Krugman 2012, p. 443). On the 1st of January of 1999 the EMU was created with irrevocably fix exchange rates of 11 countries and the Euro was introduced in circulation 3 years later.

Kempa (2002) analysed the convergence process of the EMU, before the actual introduction of the Euro, and found that countries were indeed on a convergence path, which may continue. Danthine *et al.* (2001) analysed the impact of the single currency just one year after its introduction. In the two years prior to the introduction of the Euro, the European financial market had suffered a huge transformation, which could be explained by the direct effects of the Euro, and one year after the introduction, indirect effects were being felt. Still, according to the authors, that does not mean that the efforts to promote a more homogeneous market should cease. Beine *et al.* (2003) studied the

behaviour of business cycles and identified three groups: 1) countries with synchronized cycles (Germany, Italy, Finland, Portugal, The Netherlands); 2) an intermediate group, to which France and Spain belong, and finally, 3) a more peripheral group with countries such as the UK, Norway, Switzerland and Sweden. According to the authors, the EMU, as it was, could exist fairly well.

Lane (2006) analysed how the EMU affected the economies of its members, regarding inflation and economic integration. In the run-up to the EMU, there was a significant reduction in inflation differentials during 1992-1998, but after the start of the third stage of the EMU, and during its first years, there was dispersion of inflation rates among its members. According to this work, member countries also exhibited very different economic fundamentals and showed differences in structural policies for the labour and product markets. Since national fiscal policies constituted the current adjustment mechanisms of national governments within the currency union, and since during the run-up to the EMU, in order to fulfil the convergence criteria, national fiscal positions had improved, the Stability and Growth Pact was introduced to ensure that those criteria would still be observed after accession into the EMU (Lane, 2006).

According to Hein and Truger (2005), in a monetary union real wage determination can act as an adjustment mechanism to shocks – this is why structural reforms of the European labour market were argued to be needed, to help with deregulation, decentralization of wage bargaining, to foster labour mobility and help ease the problem of unemployment. This study found that there needs to be an effective coordination of wage bargaining, otherwise this may lead to regional disparities. Moreover, the lack of moderation in nominal wage will make small countries suffer losses in unemployment and, in bigger countries, given their influence on the overall area inflation, will force the European Central Bank (ECB) to act, which can result in losses for the union as a whole, in terms of employment and output. Likewise, Issing (2000) acknowledges that national wages need to be set according to national productivities and market conditions, especially because labour mobility has a lesser role as an adjustment mechanism in Europe than when compared with the US. Another question posed by Arpaia and Pichelmann (2007) is the flexibility of wages, which seemed to be low due to interdependencies, especially during the integration process. According to the authors, smaller countries have experienced wage growth disconnected from productivity growth,

which will take time to correct and may even result in loss of competitiveness, making the whole process of adjustment even more costly.

Alesina *et al.* (2008) noted that European labour markets seemed to be made of two facets: on the one hand, there are labour unions which protect their workers and, on the other hand, there are temporary job contracts which offer very little job security. In the short run, this seems to have helped raise employment. However, in the medium to long run, that might be unsustainable, given that these two facets may fail to co-exist. This study argues that the temporary workers might force deregulation on the union labour workers, which in turn would help with labour market reforms, or the temporary workers may themselves demand more protection.

2.1.3 The "Euro Effect" on Trade

One of the most discussed benefits, presented by Emerson *et al.* (1990), was that the single currency would have a positive impact on trade, contributing to its increase among members, because there would be fewer transaction costs and lesser trading risks between countries. Naturally, the size of this "Euro effect on trade" was a topic that soon gained momentum, especially, when one has in mind the study by Rose (2000) and its striking results. Rose (2000) analysed the effects of a common currency on trade and found that trade between members which share a currency can increase up to three times as much.

Bun and Klaassen (2002) estimated this "Euro effect" on trade. According to this study, the effect can manifest itself through the real exchange rate volatility channel, as well as through other channels, namely, the credibility of the nominal exchange fix, the reduction of transaction costs and market integration. The authors estimated a cumulative increase of trade between members of 3.9% in 1999, 6.9% in 2000 and 9.6% in 2001; and in the long-run, they expect an effect of around 37.8%.

Micco *et al.* (2003) also estimated the currency union effect on trade for EMU and found the Euro to have had a positive effect on trade. According to this study, the EMU has increased trade within the currency area but also with non-EMU countries. The trade increase between members seems to have been from 4% to 10%, whilst the trade increase

between non-EMU members seems to have been from 8% to 16%. The authors, thus, concluded that the Euro has had a significant impact on trade, not only influencing trade between members, but also between the currency area and the rest of the world, while at the same time showing, remarkably, no evidence of trade diversion.

De Nardis and Vicarelli (2003) also estimated the Euro impact on trade and made the effect as independent as possible from other effects that could also influence trade, for example, cultural factors or countries' proximity. The authors found that trade had increased between 2.6% and 6.3% and, albeit small, they acknowledge that this was due to the reinforcement of trade links that had been occurring prior to the introduction of the Euro itself. Moreover, their results are focused on the short-run, and even though the authors are open to the possibility that the Euro effect on trade may increase in the long-run, they see such possibility as being unlikely.

More recently, Kunroo *et al.* (2016) examined the Euro adoption effects on trade in the EMU, from 1994 to 2011. When using a two-way fixed effects model, the authors found that if the two countries trading use the same currency, bilateral trade increases by up to 14.57%, but when they stop controlling for the time effects, the effect on trade decreases and amounts to only 11.85%. Nonetheless, these effects are higher than when only one of the countries belongs to the Euro Area.

2.1.4 The Possibility of Enlargement

Both the EU and the Euro Area would obviously be open to the possibility of admitting members in the future, especially with results proving a positive effect on trade. Naturally, new accession countries to the EU would be interested to know if they would, as well, be reaping the benefits of the single currency. This is also a pertinent question given that "All EU Member States, except Denmark and the United Kingdom, are required to adopt the Euro and join the Euro Area."[2]

[2] From https://ec.europa.eu/info/business-economy-euro/euro-area/enlargement-euro-area/who-can-join-and-when_en accessed July 2017

Fidrmuc and Korhonen (2003) analysed the correlation of demand and supply shocks between the Euro Area and the accession countries in the 1990s. The authors identified 3 groups, based on GDP and inflation correlation: 1) low similarity of GDP and inflation (Czech Republic, Lithuania, Poland, Slovakia, Turkey, smaller OECD countries and Croatia); 2) similarity of GDP, but not of inflation (Denmark, Ireland, Hungary, Bulgaria, Canada, Finland and the Netherlands); 3) similarity of GDP and inflation (EU countries, Estonia, Latvia and Slovenia). This study also found that supply shocks between Euro Area and accession countries seemed to be more correlated than demand shocks and that there are even some accession countries exhibiting very highly correlated shocks with the Euro Area - some show correlations comparable to the member countries themselves. The countries that seem to have the highest correlation of supply shocks are Hungary and Estonia, with Hungary also being the country with the highest correlation of demand shocks.

Regarding size of shocks, Fidrmuc and Korhonen (2003) also notice that it does not seem to be typically related to the size of the economy and are usually low for all accession countries, excluding Poland and Slovenia. Furthermore, Czech Republic and Estonia seem to have experienced lower shocks than those felt in the core of the Euro Area. Considering this, the authors conclude there may be an easy adoption of the Euro, which would encourage countries to proceed with structural reforms.

Frenkel and Nickel (2002) studied the correlation of supply and demand shocks between the Euro Area countries and Central and Eastern European countries (CEECs), to analyse if the latter countries can cope with the lack of monetary autonomy and exchange rates as an adjustment instrument. The rationale is that the more correlated and the faster are CEECs to recover, the better they will deal with this loss of instruments and successfully be part of the Euro Area. This study found that there are still differences in the types of shocks and on the rate of adjustment between these groups of countries. Even when the author compare the CEECs with the bigger economies of the Euro Area, namely Germany, France and Italy, their conclusion remains the same. However, when comparing individual countries, they found that the more advanced CEECs display correlations similar to those that the smaller EMU members have with the bigger EMU participants. The correlation is also likely to increase after their accession into EMU.

Frenkel and Nickel (2002) concluded that the more advanced CEECs will not have higher costs, as previously thought, if they join Euro Area.

2.1.5 Design and Structural Flaws

Despite the positive results mentioned so far, and even at the prospect of enlargement of both the EU and the Euro Area, some authors identified some design and structural flaws of the single currency area and, at that, some that might compromise these countries' ability to recover from a devastating economic recession if they were left unattended and uncorrected.

Lane (2006) points out some sources of asymmetrical shocks. The author regards entry into Euro Area as a form of asymmetrical shock, since it affected more the peripheral countries, in a structural way, and caused lending and housing booms in the periphery, contributing to enlarging the inflation differentials. Moreover, the Euro Area can amplify asymmetric shocks, especially because, with the existence of a common nominal interest rate, given inflation differentials, this translates into different real interest rates and different dissemination of investment through the whole Euro Area. This study also acknowledges that the common Euro exchange rate can result in asymmetric shocks between members depending on their trade patterns – countries which trade mainly with members of the union are sheltered from exchange rate variations, which is not the case for countries which trade with outsiders.

Hein and Truger (2005) acknowledged that the lack of an efficient mechanism of "fiscal federalism" and the restrains on both fiscal and monetary policies will make stabilization more difficult in a recession. In turn, Hein and Truger (2005) suggest that the inflation target should increase and that fiscal policies should be able to let automatic stabilizers function properly. A coordination of policies is also needed to prevent free-riding.

Matthes (2009) acknowledged some flaws, especially in southern European countries, that might affect their abilities to deal with asymmetric shocks, namely labour market rigidities and higher inflation. Likewise, Zemanek (2010) argues that there have also been structural problems among Euro Area members since the introduction of the

single currency, namely regarding price inflation and wage differentials. The channelling of savings from the core of EMU to the periphery countries also contributed to the rise of inflation in the southern countries, leading to credit booms and asset-price bubbles – this "private insurance channel" dubbed as a proxy for the inexistent fiscal transfer mechanism, might not hold in crisis times (Pasimeni 2014).

Fratzscher and Stracca (2009) studied how the EMU has influenced the way political shocks affect economies. Political shocks are being less influential in national markets, affecting smaller economies in particular – this, along with the convergence of policies and economic structures, are two benefits provided by membership in the EMU. However, there is a cost. According to the authors, financial markets will see their disciplinary role for keeping governments in check lessen, which may make politicians have fewer incentives to pursue reforms. Likewise, Wagner (2014) acknowledged the asymmetric incentives for structural reforms. When a country wants to enter the EMU, it will do everything it can to enter, including costly structural reforms. However, once it gains membership, the incentives to reform decline, because the country sees it has being less likely to be thrown out, because a members' exit will be costly for both parties. Since leaving the Euro Area will have significant costs, the decision to join should be viewed as irreversible (Lane, 2006).

2.1.6 Recent Crises and Asymmetrical Effects

Unfortunately, the Euro Area and the EU would be hit by back-to-back crises that would expose those fragilities and design flaws. The *subprime* crisis, originated in the US in 2007, resulted in a global crisis that also hit the Euro Area, and the rest of Europe. While some countries were starting to recover, others, mainly in southern Europe, were still dealing with the adjustment when they were hit yet again by a new crisis in 2010, when a sovereign debt crisis ensued and raised questions of countries' solvency.

Pasimeni (2014) concluded that the "private insurance channel" had played its part in the rise of debt on southern countries and the exposure to it by banks in the core countries, resulted in a fragile banking system. This study also pointed out that the lack of a common fiscal policy was one of the flaws in EMU's architecture and claimed that

the common budget was not efficient as a mechanism to absorb shocks. As a suggestion to help with the lack of a transfer mechanism, the author computed a common budget that could be independent from Euro Area's growth strategy and found that the main contributor would be Germany and The Netherlands, with the main beneficiary being France. Pasimeni (2014) also acknowledges that, given the current economic situation, such endeavour would be quite difficult to achieve. Zemanek (2010), however, adverts that even though some southern European countries experienced low levels of competitiveness and are suffering from current accounts deficits, a transfer union is not the way to solve the problem. In fact, this author acknowledges that it can even contribute to exacerbate the problems because countries know that, when facing troublesome times and in need of financial assistance, that would be provided by the other members, giving them no incentives to respect the limits on debt.

Notwithstanding, Europe tried to promote some reforms to help overcome recent difficulties and the ECB proceeded with unconventional policies that some feared would violate its monetary mandate to help countries which were in need (Jager and Hafner 2013). Jager and Hafner (2013) considered those reforms to not only help with the adjustment to the crisis but also in helping the future performance of the Euro Area as a currency area. Krugman (2012) pointed out that the theory of OCA had been underrated in the conception of EMU. The author also argued that the lack of fiscal integration among countries and the incapability of the ECB to act efficiently as a lender of last resort only contributed to the worsening of the overall economic environment. Krugman (2012) suggested that the ECB should reinforce its role as "lender of last resort" even at the possibility of moral hazard, because without a readily available option of liquidity, member countries in need may fall pray of self-fulfilling prophecies. Hence, according to the author, further integration seems to be necessary to make the Euro workable.

Backing of banks on a European level is also necessary, through deposit insurance, injection of capital into governments instead of loans, and rescue programmes at a European level when needed (not unlike the Trouble Asset Relief Program TARP of the US) – these were some of the measures proposed by Krugman (2012). The author also suggests that the inflation target should increase, in order to help the more peripheral European countries regain competitiveness and not be so penalised by the burden of adjustment. Degiannakis *et al.* (2016) advise that institutional constraints to fiscal policy

should not choke its ability to act when it is necessary, but when fiscal limits are breached, other forms of stabilisation mechanisms should come into play, such as a 'union-wide borrowing facility' or other forms of fiscal transfer systems.

2.1.7 Euro Area Convergence

Prior to the introduction of the Euro, the hypothesis of an "endogeneity of OCA" started to emerge and somewhat justified early admission of countries which did not quite achieved a significant level of real convergence. Hence, naturally, some years further along the European experience, some studies regarding convergence emerged.

Regarding convergence within the Euro Area, it seems to have been a lot faster in the decade preceding the Euro adoption (Vieira and Vieira, 2012) and even though it strengthened relationships between members, namely increasing trade and business cycle synchronisation, the same also appears to have happened between the Euro Area and other European countries (Willett *et al.*, 2010). Degiannakis *et al.* (2016) found that, overall, fiscal policy has an important role in determining business cycle synchronization across Euro Area members. According to the authors, fiscal policy has a significant impact for Finland, Germany, Greece, Italy, Ireland and Portugal, but has a smaller effect on other countries such as Austria or Belgium.

There has been an improvement regarding the OCA properties, but that seems to be verified only in core countries (Vieira and Vieira, 2012). The necessary degree of real convergence seemed to be lacking (Andrade and Duarte, 2015) and there were even possible divergences (Wagner, 2014). Some authors blame this on the fewer structural reforms undertaken after admission into the Euro Area (Willett *et al.*, 2010 and Wagner, 2014) and argue that entry should not be an excuse to lessen them (Barbosa and Alves, 2011).

Regarding labour, Campolmi and Faia (2011) also found that there are different labour market institutions across Europe which can impact, in different ways, inflation, real wages and firm costs, when countries are faced with shocks, and may result in welfare losses. They also noted more volatility in two situations: if unemployment is less protected or if employment is more protected.

Labour market mobility is often classified as not being fully satisfied due to language and cultural barriers, regulatory constraints and work permits (Pasimeni, 2014; Andrade and Duarte, 2015) and even regional attachment (Andrade and Duarte, 2015). This seems to translate into a less effective shock absorption mechanism (Jager and Hafner, 2013 and Pasimeni, 2014), especially when one compares it with the US case (Pasimeni, 2014). Moreover, there seem to be differences in the workforce of northern and southern countries, with the north being more technological and innovative whereas the south is more reliant on less qualified workers (Andrade e Duarte 2015). Recent crises seem to have forced labour mobility with people moving from deficit to surplus countries, in search of employment opportunities (Pasimeni, 2014), namely there was increased migration from southern European to northern European countries (Chojnicki *et al.*, 2016). This increase in migration should improve the European labour market ability to act as a shock absorption mechanism (Chojnicki *et al.*, 2016).

2.2 Other Regions' Experiences in Light of the OCA Theory

2.2.1 The United States Experience

One of the longest currency unions in existence is the United States of America. Hence, it is only natural that when Europe decided to pursue such an ambitious endeavour it looked at the American experience. It is also natural that comparisons between the two economic areas would arise, and so the US became the benchmark to analyse the EMU experience (Partridge and Rickman 2005). For example, prior to the establishment of the Euro Area, Bayoumi and Eichengreen (1992) found that the US suffered less asymmetric shocks and had faster adjustments then EU and Bayoumi and Prasad (1997) found that the US had a better integrated labour market. The US has had a rich history regarding its currency[3]. The US monetary union has been around since the adoption of the United States Constitution in 1788, which makes it easy to understand why the US is often used as example for the benefits of a currency union (Rockoff 2000).

[3] For a more detailed study on the US currency history see, for example, Rockoff (2000).

However, whether or not it is an optimal currency area is often overlooked (Partridge and Rickman 2005). Partridge and Rickman (2005) examine this issue, by analysing regional business cycles synchronisation in the US, between 1971-1998. This study found evidence of asymmetries in regional business cycles throughout the period. In fact, synchronisation appears to have decreased in the late eighties, which is attributed to an overall decline in business cycles volatility .

Beckworth (2010) found that, for 1983-2008, a lot of the states had lower correlation with the national business cycles than would be expected, with 24 of them showing correlation below 70%. These lesser correlated States tended to suffer more with the asymmetrical impact of a monetary policy shock. The author concludes that these particular economies may have been better off, in 1983-2008, if they were not part of the dollar monetary union. Even if the results show that some states may succeed with separate currencies and monetary policies, these results should be approached with caution since this analysis only pondered on the potential gains derived from having separate currencies. The author acknowledges that there are certainly potential costs that were not addressed. The US shies away from being an OCA and the government should promote policies that will assure convergence of all states (Beckworth 2010).

Chupp (2016) tested potential combinations of regional groups and found one combination that showed an increase in welfare by comparison with the current situation. This is probably not the optimal division but, in turn, helps sustain that the US is not an OCA. Redesigning an existing currency area, particularly one of the size of the US, does not come without costs, but the welfare increase will be sufficient to surpass those costs (Chupp 2016). Although having a long monetary history, Rockoff (2000) acknowledges that the US only became close to an optimal currency area after the 1930s, which took at least one hundred and fifty years.

2.2.2 The Possibility of Currency Areas in Asia

Considering the European and the American experiences in sustaining monetary unions, there is no doubt that they would inspire the prospect of other monetary unions in the rest of the world. There has been a sparked interest in whether there is a possibility

for the formation of a monetary union in East Asia. This rising interest may be attributed to several factors, namely: 1) the World Trade Organization and the Asia-Pacific Economic Cooperation have not been able to achieve a desired level of trade liberalization (Lee and Azali, 2012), 2) the success of both the US and the Euro Area as currency areas (Lee and Azali, 2012) and 3) the 1997 Asian financial crisis (Sato and Zhang, 2006; Hsu, 2010; Lee and Azali, 2012).

Sato and Zhang (2006) compare a possible East Asian monetary union with the Euro Area experience. Euro Area integration is more institutional, while East Asia integration is more market driven, being propelled by firms through the reinforcement of trade, foreign direct investment (FDI) and other forms of arrangements. The authors studied the co-integration of output and found that there were some country pairings which showed common business cycles in the short run and similar long run output co-movements, namely Singapore with Thailand and with Indonesia; Hong Kong with Korea and with China; and finally, Japan with Taiwan. Thus, according to this study, a monetary union among each of these pairings could be implemented with few costs.

Hsu (2010) analysed how East Asia responds to domestic, regional and global shocks, in order to identify if there is a common "prevalent shock". After the Asian crisis there seems to have been a sharp decline of asymmetrical shocks in the region, and a rise in symmetric global and regional shocks. On the basis of this result only, a common currency area could be viable with further economic integration. However, when comparing with the Euro Area, regional shocks have become more important and domestic shocks showed reductions for the majority of countries. This study acknowledges that there has been a change in the 'prevalent shock' from domestic to regional or global. The author is aware that the findings are not enough to provide strong support for a common currency area but that it is feasible in the future if countries continue to strengthen their economic relations and interdependences.

Lee and Azali (2012) also analyse the impact of domestic, regional and global shocks in East Asia, using the US and Europe as a benchmark. According to this study, there was a reduction in country-specific shocks for the majority of the East Asian economies. These economies also seem to be less affected by global shocks when compared to the European and North-American economies, which might explain why

they were not as affected as the US and Europe by the recent global financial crisis. Lee and Azali (2012) also found that the importance of regional shocks has increased and this is prossibly explained by the fostering of financial integration and trade linkages. East Asia is becoming more and more prepared for a monetary union.

Shafighi and Gharlighi (2016) also explore shocks in East Asia. This study found that external supply shocks and external monetary shocks seemed to have a quicker transmission across the region which would mean that a monetary area could exist with few issues. Demand shocks also seem to be significant for most countries. According to the authors, a currency area in East Asia has become more feasible, especially when one keeps in mind that adjustment to shocks seems to have become faster when compared with previous studies. However, the authors are aware that their findings do not lend strong support for a currency area in the region and advise that a smaller union might yield better results.

Quah (2012), using the Euro Area as a benchmark, also tries to evaluate whether East Asia is ready for a currency union and which country should serve as the monetary anchor: the US, Japan or China. This study uses several indicators to measure key OCA criteria, *e.g.*, inflation convergence, business cycle synchronisation and openness to trade. Concerning the monetary anchor, the US has a better score than Japan, but Japan seems better than China. East Asia countries seem to be as prepared as the founding members of the EMU were when they entered the currency area, especially when the monetary anchor is the USD (Quah, 2012).

Dufrénot and Keddad (2014) studied the feasibility of five countries of the Association of the Southeast Asian Nations (ASEAN) as a currency area, by analysing synchronisation, during different phases of business cycles[4]. This study found evidence of business cycle synchronisation within the region, but also that a sufficient degree of synchronisation had not yet been achieved. These countries were not fully prepared to enter a monetary union and required further efforts to strengthen their regional economic cooperation. To sustain their view, the authors explained that these countries are still

[4] Those countries were Singapore, Indonesia, Malaysia, Thailand and The Philippines.

facing high dependence from external demand, which would mean that they might not be able to have a self-sustained growth strategy all by themselves.

In conclusion, and regarding East Asia, there is evidence to support the viability of a monetary union (for example, Hsu, 2010; Quah, 2012 or Lee and Azali, 2012), with some countries showing levels of readiness comparable to those of the founding members of EMU (Quah 2012). Although, some authors still advise further investigation (Hsu, 2010 and Shafighi and Garlighi, 2016), and others, smaller monetary unions (Sato and Zhang, 2006 and Shafighi and Garlighi, 2016).

Regmi *et al.* (2015) analysed South Asian countries, as an OCA, through the study of domestic, regional and global shocks, and using the Euro Area as a benchmark. This study, which included Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan and Sri Lanka, found these economies to be more affect by country-specific shocks. By comparison with the Euro Area, regional shocks still play a lesser role in South Asia. According to the authors, South Asian countries are not fit for a common currency because domestic shocks seem to be more persistent than regional and global shocks. Regmi *et al.* (2015) suggest that a smaller currency union might yield better results, especially if comprised of Bangladesh, Bhutan, India and Nepal.

2.2.3 The African Experience and New Possibilities

Africa also shows initiatives for the creation of monetary unions. One monetary union is comprised by Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal and Togo, and is known as the West African Economic and Monetary Union (WAEMU).[5] There are efforts being made to extend this monetary union to the rest of the West African economies. The process will be made in two stages. First, the majority of the Non-WAEMU members (Gambia, Ghana, Guinea, Liberia, Nigeria and Sierra Leone) will form another monetary union, the West African Monetary Zone (WAMZ).[6] Second,

[5]For more information on WAEMU, please consult http://www.uemoa.int/en, accessed on July 2017;

[6]For more information on WAMZ, please consult http://www.wami-imao.org/, accessed on July 2017;

both monetary unions, along with Cape Verde, will come together and form a monetary union within the Economic Community of West African States (ECOWAS).[7]

Houssa (2004) analysed the expansion of the WAEMU monetary union, by studying asymmetric demand and supply shocks in West Africa. This study analysed two distinct groups of countries, WAEMU (Benin, Burkina Faso, Côte d'Ivoire, Niger, Senegal and Togo) and WAMZ (Ghana, Gambia and Nigeria). The author concluded that both groups of countries, overall, show higher correlation of demand shocks than supply shocks and, therefore, a monetary union with both groups may be costly.

Quah (2016), using several indicators under the OCA theory framework, analyses WAEMU as a monetary union, and compares its performance to three reference countries: the US, China and EMU. Some of these indicators include, for example, business cycles synchronisation, inflation convergence and trade integration. According to the author, overall, the EMU position as reference country does not seem to be as dominant, especially after the global financial crisis. On the other hand, China has been gaining importance in several aspects. This study concludes that WAEMU shows low levels of compliance with the OCA criteria.

Loureiro *et al.* (2012) used the OCA theory to analyse two distinct African monetary unions, the WAEMU and the Central African Economic and Monetary Community (CAEMC)[8], as well as Cape Verde and Comoros. These 16 economies are analysed not only in respect to their pegs but, in the case of the monetary unions, regarding their feasibility as well. This study also analyses whether the US would be a better fitting peg. According to this study, both WAEMU and CAEMC show similar levels of trade, with intra-union trade being lower for both, especially when using the Euro Area as a benchmark. Both monetary unions also show very different business cycles, with WAEMU having a group of countries with relatively similar cycles. The majority of these countries have low inflation rates. Aside from Cape Verde, which clearly benefits from pegging to the Euro, it is not possible to point out which peg is better

[7]For more information on ECOWAS, please consult http://www.ecowas.int/, accessed on July 2017;

[8] CAEMC is comprised by Camerron, Central African Republic, Chad, Republic of Congo, Equatorial Guinea and Gabon.

for each of the remaining countries. Considering these findings, the authors acknowledge that both monetary unions shy away from being OCAs.

Baptista (2015) analysed the formation of the WAMZ, with the participation of Cape Verde. This study used three criteria based on the OCA theory: similarity of inflation rates, trade integration and business cycles correlation. The author found that if the WAMZ was to be created it would not constitute an OCA since there is, overall, low similarity of inflation rates, low levels of intra-union trade integration, and the business cycles are not very well correlated. Furthermore, if Cape Verde were to decide to join this new union, its benefits may not be sufficient to exceed the costs. Assuming that the creation of WAMZ would go through, and that political authorities decided that the new currency would follow a fixed pair regime, this work tried to determine what currency should they peg to, either the Euro or the Dollar, and did not find sufficient evidence to propose one over the other.

Loureiro *et al.* (2010), using the OCA theory framework, analysed the official euroisation of Cape Verde. This study uses different indicators inspired by the OCA theory, to assess how Cape Verde compares against 27 members of the EU. According to the authors, Cape Verde shows low inflation and is a highly open country, showing high trade integration with EMU. Concerning business cycles correlation, the country also appears to be highly correlated with EMU. The authors conclude that Cape Verde will reap benefits from euroisation and see no objections in moving forward with this process.

Chapter 3. From Theory to Practice

Upon reviewing the literature, one can find many different methodologies being employed to assess currency areas in light of the OCA theory. Although some are used more often than others, the list includes, for example, descriptive analyses (see, for example, Loureiro *et al.*, 2012 and Quah, 2016), the calculation of an "OCA index" developed by Bayoumi and Eichengreen (1997) (other work include, *e.g.*, Barbosa and Alves, 2011 and Skorepa, 2013) and the use of Vector Autoregression (VAR) (*e.g.*, Bayoumi and Eichengreen, 1992 and 1994, and Kempa, 2002). In other studies we can find the use of Rolling Correlation (e.g., Stanisic, 2013), Bayesian Dynamic Factor Model (*e.g.*, Lehwald, 2013) and the use of an Unobserved Component Model (*e.g.*, Hall and Lagoa, 2014). As we can see, the list of methodologies applied to the OCA theory is extensive. Moreover, there are numerous studies focusing solely on a few aspects of the theory, for example, analysing business cycles synchronisation (*e.g.*, Beckworth 2010) or migration (*e.g.*, Chojnicki *et al.*, 2016). However, we will be reviewing the three methodologies that appear to be applied more often to the OCA theory as a whole. These three are the OCA Index, VAR analysis and the methodology that we will also be using in this dissertation - descriptive analysis.

Bayoumi and Eichengreen (1997) developed an "OCA index" as a way to operationalise the theory and rank how European countries would fair with a common currency. In order to do so, the authors used the components that determined nominal exchange rate variability. For their sample, the authors used averages of 10-year periods, starting in 1973 and ending in 1992. Other studies that have also followed this approach are Barbosa and Alves (2011) - with the authors adding a new variable to measure the growth of unit labour costs -, Vieira and Vieira (2012) and Skorepa (2013) - with the author modifying the original Index to make it sensitive to real income convergence.

The VAR methodology, applied to the OCA theory framework, is used to analyse shocks, for example, shocks to aggregate demand and supply or output (*e.g.*, Bayoumi and Eichengreen, 1992 and 1994; Bayoumi and Prasad, 1997; Kempa, 2002); or to determine common shocks (national, regional or global) affecting a particular economy (*e.g.* Hsu, 2010; Lee and Azali, 2012).

Concerning descriptive analyses, there are examples applied not only to the European experience, but also in Asia and Africa. The indicators one may use are vast and can be applied not only to OCA criteria, but also key-economic variables, such as the evolution of current accounts or debt levels. Regarding Europe, we have, for example, the studies of Artis and Zhang (2002), Barbosa and Alves (2011), Jager and Hafner (2013) and Pasimeni (2014). The studies of Loureiro *et al.* (2010 and 2012), Baptista (2015) and Quah (2016) are examples of studies focusing on Africa. Regarding Asia, we have, for example, the studies of Nguyen (2007), Quah and Crowley (2010, 2012a and 2012b) and Quah (2011, 2012, 2013). As mentioned before, there is a large number of indicators used in this literature, varying the number of indicators effectively used by each author (for example, while Loureiro *et al.*, 2010 and 2012, use 3 indicators, Quah, 2016 uses 9 indicators). Nonetheless, inflation convergence, business cycles synchronisation and trade integration, appear to be among the most often used.

This dissertation intends to study the Euro Area experience, as a possible OCA, since its start and including the recent crises period. By using a descriptive analysis we will be able to provide an overall image of what has happened during this sample that includes such distinct periods as the pre-crisis and the crisis periods. We will do so by analysing the evolution of five indicators that may encompass the main OCA criteria and that have also been the main focus of previous studies of this kind: (i) inflation differentials; (ii) trade integration; (iii) export diversification; (iv) business cycles correlation; and (v) labour mobility. We will analyse the annual evolution of each indicator, as well as each period average for all indicators. We will also measure the standard deviation of inflation differentials.

In order to accomplish this analysis, two distinct periods will be compared: the first period goes from 1999 to 2007, which can be seen as the pre-crises period; the second period covers 2008 to 2016.[9] This second period includes not only the 2008 global financial crisis, but also the 2010 sovereign debt crisis, two major shocks that have hit the Euro Area. One of the objectives of this dissertation is to establish whether the Euro Area is closer or farther from the concept of an OCA. Regarding the period before the

[9]Except for indicators (ii) and (iii), which due to data restrictions will end in 2015, and except for indicator (v), in which there are only 4 distinct years in our sample.

introduction of the Euro, literature suggests that the OCA criteria appears to not have been fully achieved by member countries (Wagner, 2014; Andrade and Duarte, 2015).

Regarding the countries under analysis, this dissertation will focus on the European Union members. These countries will be grouped in the following way. Regarding Euro Area (EA-19), there are two groups: founding members and recent members. We consider founding members to be the first countries to form the Euro Area[10], in 1999, plus Greece that joined in 2001. Recent members encompasses all other accessions[11]. Regarding the remaining EU members[12], they will be addressed as Non-EA EU28 members. We will now elaborate on each indicator to be analysed.

(i) Inflation Differentials

Concerning inflation differentials, there are a significant number of empirical studies that use this indicator (*e.g.*, Artis and Zhang, 2002; Nguyen, 2007; Loureiro *et al.*, 2010 and 2012; Quah and Crowley, 2010, 2012a and 2012b; Quah, 2011, 2012, 2013 and 2016; Baptista, 2015). We will analyse the behaviour of inflation differentials, particularly each period average and standard-deviation. In our case, we will calculate the inflation differentials of each country in our sample with the Euro Area 19 (EA-19). EA-19 has been chosen as the benchmark since it encompasses all of the current members and therefore it is able to provide a better view of how it fairs concerning the OCA theory. Inflation rates were calculated by the author, on the basis of the annual Harmonised Consumer Price Index (HCPI) from the AMECO database[13]. This indicator is calculated as the absolute value of the inflation differential,

$$InflationDifferentid_i = \left|\pi_i - \pi_{EA19}\right|,$$

[10] Founding members of Euro Area: Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, The Netherlands, Portugal and Spain

[11] Accession dates: Slovenia (2007), Cyprus (2008), Malta (2008), Slovakia (2009), Estonia (2011), Latvia (2014) and Lithuania (2015)

[12] Non-EA EU28 Members: Bulgaria, Croatia, Czech Republic, Denmark, Hungary, Poland, Romania, Sweden and the UK

[13] http://ec.europa.eu/economy_finance/ameco/user/serie/ResultSerie.cfm accessed in April 2017

where π_i is the rate of inflation of country i and π_{EA19} is the rate of inflation for the whole EA-19. With the absolute value we can measure the magnitude of each countries' differentials and evaluate how inflation rates compare to that of the whole Euro Area.

(ii) Trade Integration

Regarding trade integration, there are a few studies that analysed this, although using different ways to measure integration (*e.g.*, Artis and Zhang, 2002; Nguyen, 2007; Loureiro *et al.*, 2010 and 2012; Quah and Crowley, 2010, 2012a and 2012b; Quah, 2011, 2012, 2013 and 2016; Baptista, 2015). This dissertation will measure trade integration as,

$$TradeIntegration_i = \frac{\frac{Xs_i + Ms_i}{2}}{GDP_i} \times 100,$$

where Xs_i refers to exports to EA-19 by country i, Ms_i refers to imports from EA-19 by country i and GDP_i refer to GDP of country i. The data on imports from and exports to the EA-19, were obtained from the United Nations Conference on Trade and Development Statistics (UNCTADStat)[14]. This database was chosen since it provided the possibility to select the trading partner, in this case, EA-19. The data on GDP comes from the International Monetary Fund (IMF), World Economic Outlook Database[15].

(iii) Export Diversification

Concerning export diversification, Nguyen (2007) measured export diversification using the inverse of the Herfindahl Index, acknowledged as a popular indicator of the degree of specialization. Quah (2011, 2012, 2013 and 2016) and Quah and Crowley (2010 and 2012a) have also used this indicator to measure export diversification. This dissertation will measure export diversification using an index available at UNCTADstat[16], called the Product Concentration Index. This index also

[14] Exports:http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=24739 accessed in April 2017

Imports:http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=24741 accessed in April 2017

[15]https://www.imf.org/external/pubs/ft/weo/2017/01/weodata/index.aspx accessed in April 2017

[16]http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=120 accessed in April 2017

measures export product diversification, and has a similar interpretation to that of the index used by the authors mentioned above. The Product Concentration Index is a modified Herfindahl-Hirschmann Index, whose values take place between 0 and 1. This Index is calculated by the following formula,

$$H_i = \frac{\sqrt{\sum_{j=1}^{n}\left(\frac{x_{ji}}{X_i}\right)^2} - \sqrt{1/n}}{1-\sqrt{1/n}},$$

where H_i refers to this index for country *i*, x_{ji} is the value of exports from country *i* and product *j*, *Xi* is the total exports of country *i* and n refers to the total number of products of country *i*. On the one hand, if the index value is closer to 1, then the country's exports are concentrated on a few products. On the other hand, if the value is closer to 0, exports are more evenly distributed.

(iv) Business Cycles Synchronisation

Regarding business cycles synchronisation, we find a few studies which use a correlation coefficient (*e.g.*, Artis and Zhang, 2002; Loureiro *et al.*, 2010 and 2012; Quah and Crowley, 2010, 2012a and 2012b; Quah, 2011, 2012, 2013 and 2016; Baptista, 2015). In order to measure business cycle synchronisation, this dissertation will also use a similar correlation coefficient. The correlation coefficient is measured as,

$$\rho(g_i, g_{EA-19}) = \frac{Cov(g_i, g_{EA-19})}{\sigma(g_i).\sigma(g_{EA-19})} = \frac{\Sigma(g_{i(t)} - \overline{g_i}).(g_{EA-19(t)} - \overline{g_{EA-19}})}{\sqrt{\Sigma(g_{i(t)} - \overline{g_i})^2.(g_{EA-19(t)} - \overline{g_{EA-19}})^2}},$$

where $g_{i(t)}$ is the output gap for country i in year t, $g_{EA-19(t)}$ is the Euro Area's output gap in year t, $\overline{g_i}$ is the average output gap of country i and $\overline{g_{EA-19}}$ is the Euro Area's average output gap. Data on output gaps was obtained from the AMECO database[17].

[17] http://ec.europa.eu/economy_finance/ameco/user/serie/ResultSerie.cfm accessed in April 2017

(v) Labour Mobility

Regarding labour mobility, we are aware that it is a very complex topic and, at that, one that has sprouted a lot of empirical studies, as well as different perspectives on the subjective. Some studies focused on the regulatory aspects of labour markets (*e.g.*, Artis and Zhang, 2002; Alesina *et al.*, 2008; Quah and Crowley, 2010 and 2102b; Quah, 2011, 2012, 2013 and 2016), while other authors focused on migration (*e.g.*, Gros, 1996; Chojnicki *et al.*, 2016). This dissertation will analyse migration in the Euro Area, how it has evolved and how it was affected by the crises. Using emigration as proxy for labour mobility, this dissertation will gauge the magnitude and the evolution of emigration from our sample of countries to EA-19 as a whole. To clarify, we will calculate the ratio between the number of emigrants from country *i* to EA-19 ($Emigrants_{iEA\text{-}19}$), and each countries' total population ($TotalPop_i$),

$$LabourMobility_i = \frac{Emigrants_{iEA-19}}{TotalPop_i}$$

We will analyse how emigration has evolved in four distinct years: 2000, 2005, 2010 and 2015. This is due to data restrictions, since the database, the United Nations Migrant Stock by Origin and Destination report[18], only supplies a 5-year data frequency. This database was chosen because it offers the ability to measure migration to a particular destination, and since we are interested in assessing mobility within the Euro Area, the ability to know the destination is essential. The data on total population comes from UNCTADstat Database[19].

[18] http://www.un.org/en/development/desa/population/migration/data/estimates2/estimates15.shtml accessed in April 2017

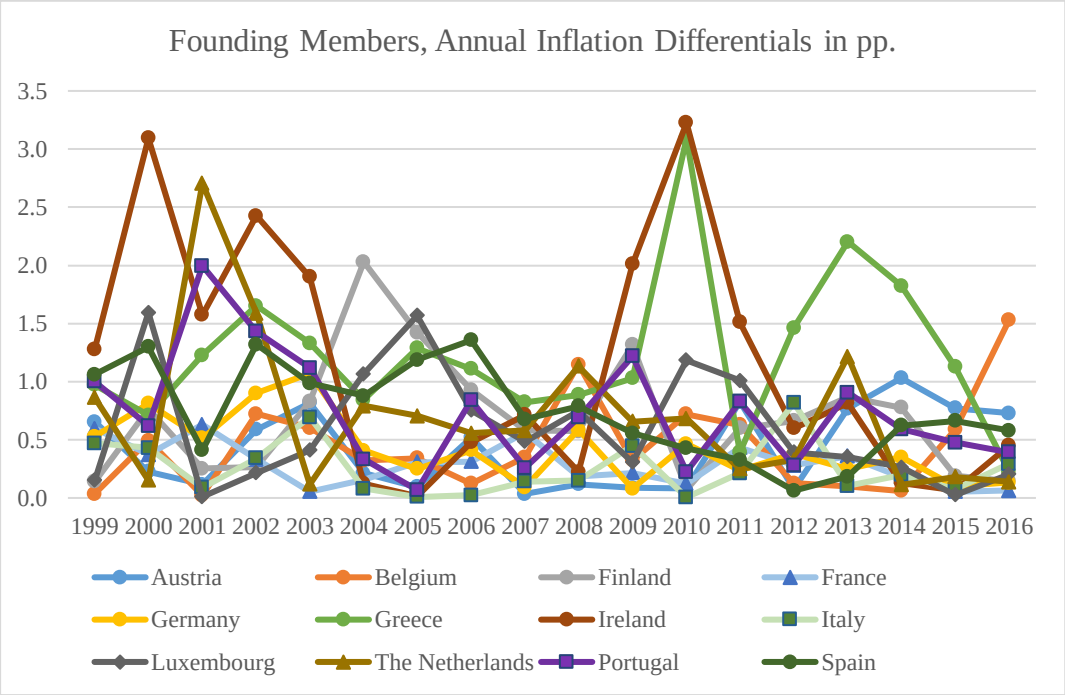
[19] http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=97 accessed in April 2017

Chapter 4. Empirical Analysis

4.1 Inflation Differentials

Considering the Euro Area founding members' results regarding the time pattern of inflation differentials (Figure 1, below), we can see that Greece and Ireland stand out for their volatile behaviour. In fact, the largest differential for both periods is roughly around 3 percentage points (pp.), and occurred in Ireland in both periods (2000 and 2010) and in Greece in the second period (2010). Excluding Ireland and Greece, inflation differentials for 1999-2007 appear to be no higher than 2 pp., and for 2008-2016 they are below 1.5 pp. The majority of the founding members appear to be on a convergence path.

Figure 1 – Founding Members, Annual Inflation Differentials

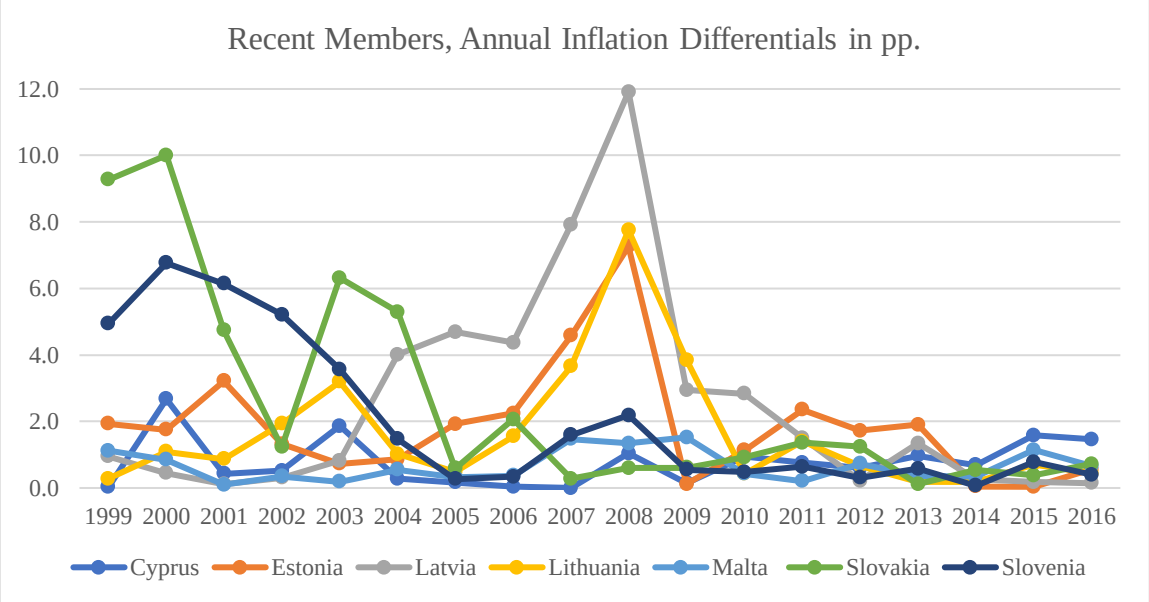


Source: Author's calculations on the basis of data from AMECO Database

Regarding the time pattern of inflation differentials of recent Euro Area members (Figure 2) we can observe that the first period was clearly more volatile, especially in the cases of Slovakia, Slovenia, Latvia, Estonia and even Lithuania. In more recent years, especially after 2013, inflation differentials for the recent members have been below 2

pp. and appear to be converging, although they seem to remain higher than most founding members.

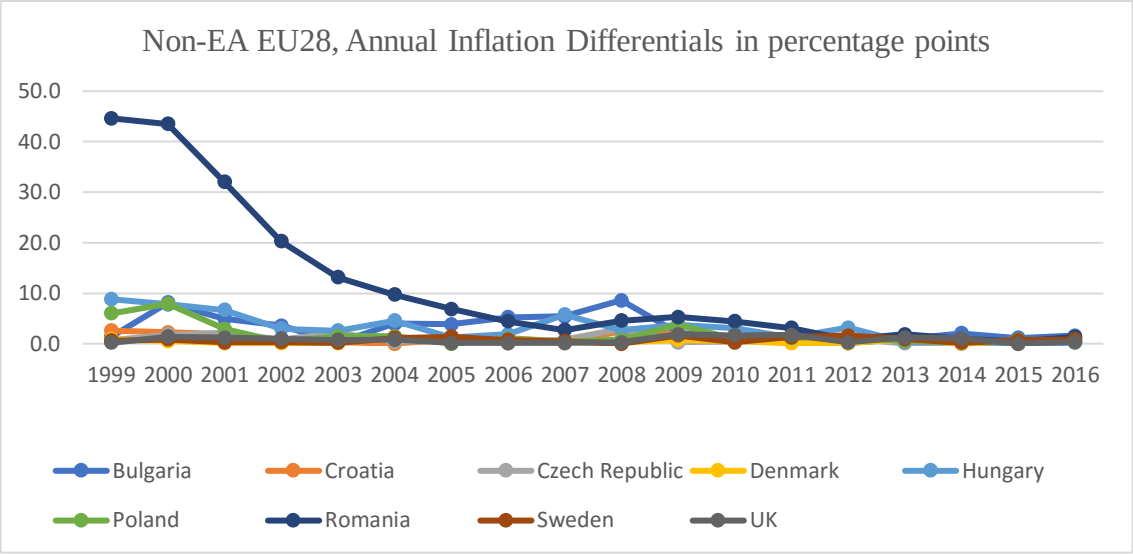
Figure 2– Recent Members, Annual Inflation Differentials



Source: Author's calculation on the basis of data from AMECO Database

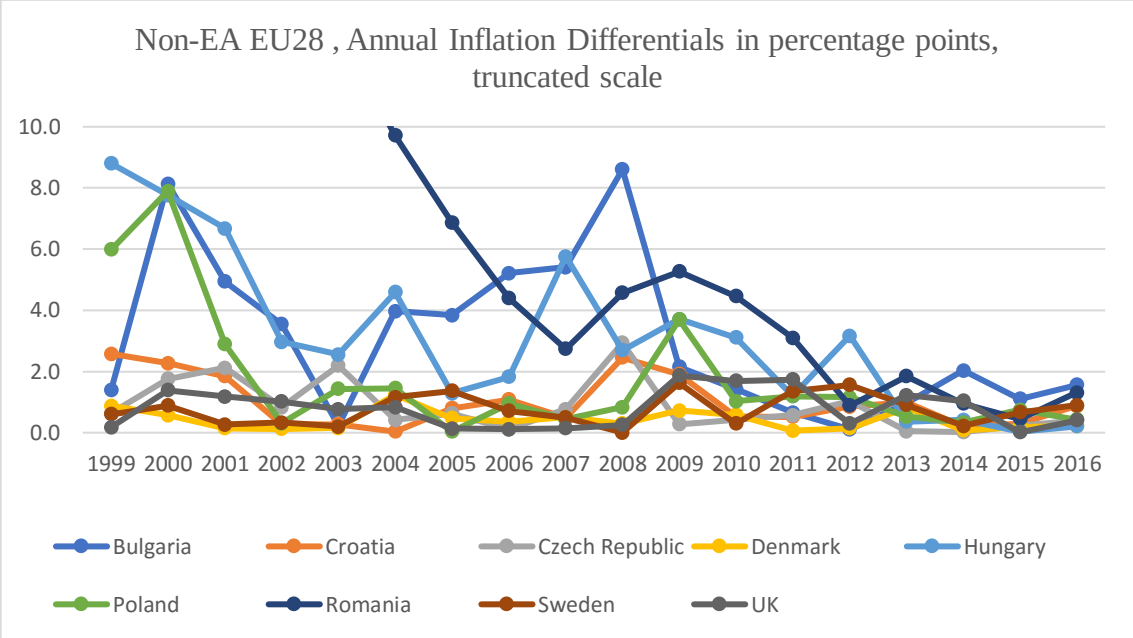
Regarding the time pattern of inflation differentials for the remaining Non-EA EU28 members (Figures 3 and 4), Romania stands out the most with its largest differential. In 1999-2007, Romania has shown a large inflation differential against EA-19, although convergence is also quite evident. In Figure 4, the dispersion among the remaining members of EU28 becomes more apparent. Besides Romania, the countries which show the most volatile behaviour include Hungary, Bulgaria and to some extent, Poland. Figure 4 also illustrates the convergence of the Non-EA EU28 members: after 2013 these countries were able to have differentials varying between 0 and 2 pp., values that are very similar to those of the EA-19 members for the same period.

Figure 3 – Non-EA EU28 Members, Annual Inflation Differentials



Source: Author's caculation on the basis of data from AMECO Database

Figure 4 – Non-EA EU28 Members, Annual Inflation Differentials, truncated scale



Note: Truncated Scale

Source: Author's calculations on the basis of data from AMECO Database

Looking at the time pattern of inflation differentials, for all three sets of countries, it appears that they were on a convergence path and became more similar in 2008-2016. We will now analyse both periods, concerning average differentials and standard-

deviation. Results for EA-19 members and Non-EA EU28 members are shown in Table 1, below.

Table 1 – Inflation Differentials, EA–19 and Non–EA EU28

Euro Area	Average Inflation Differentials against EA-19 (pp)		Standard-Deviation against EA-19 (pp)	
Founding Members	1999-2007	2008-2016	1999-2007	2008-2016
Austria	0.36	0.50	1.23	0.63
Belgium	0.33	0.58	1.25	0.58
Finland	0.80	0.58	0.92	0.58
France	0.37	0.21	1.22	0.84
Germany	0.55	0.29	1.09	0.78
Ireland	1.29	1.00	0.57	0.28
Italy	0.25	0.26	1.31	0.81
Luxembourg	0.70	0.50	0.99	0.63
The Netherlands	0.90	0.52	0.85	0.62
Portugal	0.85	0.62	0.88	0.55
Spain	1.02	0.47	0.76	0.66
Greece	1.11	1.36	0.70	0.02
Recent Members	1999-2007	2008-2016	1999-2007	2008-2016
Slovenia	3.37	0.66	0.89	0.52
Cyprus	0.67	0.91	1.01	0.34
Malta	0.59	0.75	1.07	0.46
Slovakia	4.42	0.72	1.64	0.48
Estonia	2.06	1.68	0.03	0.20
Latvia	2.62	2.37	0.37	0.69
Lithuania	1.56	1.73	0.38	0.24
EA-19 Average	1.25	0.83	0.90	0.52
Non-EA EU28	Average Inflation Differentials against EA-19 (pp)		Standard-Deviation against EA-19 (pp)	
	1999-2007	2008-2016	1999-2007	2008-2016
Bulgaria	4.08	2.07	1.40	0.48
Croatia	1.07	0.96	0.73	0.31
Czech Republic	1.05	0.66	0.74	0.52
Denmark	0.49	0.35	1.14	0.74
Hungary	4.69	1.65	1.83	0.18
Poland	2.38	1.10	0.20	0.20
Romania	19.70	2.54	12.45	0.81
Sweden	0.67	0.84	1.01	0.39
UK	0.64	0.95	1.03	0.32
Non-EA EU28 Average	3.86	1.24	2.28	0.44

Note: Simple unweighted average;

Source: Author's calculations on the basis of AMECO Database

Concerning the first period, 1999-2007, regarding average inflation differentials, we can observe that the EA-19 average for this period is 1.25 pp., with 0.25 pp. being the lowest inflation differential (Italy), and 4.42 pp. the highest (Slovakia). It is important to note that the lowest differentials pertain to founding members of the EA (Italy, Belgium,

Austria and France), while the highest are observed for recent members (Estonia, Latvia, Slovakia and Slovenia). The latter were not then member states of the EA, and, therefore, were still in the process of convergence. As shown in Table 1, there are 13 countries that show average inflation differentials below the EA-19 average. This evidence of dispersion appears to be in line with Lane (2006). After the start of the EMU and in its first years there was dispersion of inflation rates among members of the Euro Area (Lane, 2006).

Regarding each country's standard-deviation for 1999-2007, we can observe that the EA-19 average for this period is 0.9 pp., the lowest value is 0.3 pp. (Estonia) and the highest is 1.64 pp. (Slovakia). It is important to mention, contrary to what we saw regarding average differentials, the lowest volatilities belong to recent members (Estonia, Latvia and Lithuania). Excluding Slovakia, the highest volatilities belong to a few founding members (Italy, Belgium, Austria and France). Slovakia shows, for this period, not only the highest average differential but also the highest volatility. As shown in Table 1, below the EA-19 average standard-deviation there are 9 countries, including 5 founding members.

Concerning inflation differentials in 1999-2007, and considering the OCA theory, the founding members of EA appear to be closer to an OCA than recent members. This is evident, especially when we keep in mind that almost all founding members appear to be below the EA-19 average.

Focusing on the second period, 2008-2016, regarding average inflation differentials, we can observe that the EA-19 average for this period is 0.80 pp., the lowest average inflation differential is now 0.21 pp. (France) and the highest is 2.37 pp. (Latvia). The lowest differentials belong to founding members (France, Italy and Germany), with recent members showing the highest differentials (Latvia, Lithuania and Estonia). As we can see in Table 1, there are 14 countries below the whole area average. Concerning standard-deviation, for the second period we can observe that the EA-19 average is 0.52 pp., the lowest value is 0.02 pp. (Greece) and 0.84 pp. is the highest (France). Excluding Greece, the lowest volatilities belong to recent members (Estonia and Lithuania). The highest volatilities belong to a few founding members (France, Italy and Germany). As we can see in Table 1, there are now 8 countries with values below the EA-19 average.

Comparing both periods, we can see that both, the EA-19 average differentials and volatilities, were reduced by about one third and 40%, respectively. The EA-19 as a whole, and concerning this indicator, appears to be more uniform. It is also important to highlight the cases of Slovakia and Slovenia: although showing the highest average differentials in the first period, these countries were able to converge to EA-19, showing reductions of 84% (Slovakia) and 80% (Slovenia). Despite showing signs of convergence, Estonia and Latvia, as well as Lithuania, with a slight divergence, continue to show average inflation differentials that are more than double of that of the EA-19 average. In turn, this could make us question their respective accessions, at least in light of this indicator. The large majority of founding members continue to show inflation differentials below the EA-19 average. New members also show a positive evolution, and that seems to be consistent with their accession (*e.g.*, Malta, Slovakia and Slovenia).

Convergence among the Euro Area members, regarding this indicator and considering the OCA theory, has had a positive evolution. Andrade and Duarte (2015) noted the existence of inflation convergence in the Euro Area, and that also seems to be the case in our analysis.

In conclusion, there are clear differences between the two periods under analysis. Despite 2008-2016 being the more turbulent period and having to deal with the effects caused by both crises, there are a lot of countries which were able to reduce their inflation differentials and improve their convergence with the Euro Area. Not only that, but 2008-2016 also shows the lowest volatility regarding this indicator, which seems to confirm the convergence path of most Euro Area members. The analysis of this indicator allows us to conclude that recent crises may have had a positive effect on inflation differentials, fostering convergence in the Euro Area. Thus, concerning inflation differentials, the Euro Area members appear to be closer to forming an OCA in 2008-2016 than they were in 1999-2007.

As regards to the remaining Non-EA EU28 members (Table 1, above), during the first period, 1999-2007, Romania stands out with the highest average inflation differential of 19.7 pp., while the lowest is 0.49 pp. (Denmark). The Non-EA EU28 average is 3.86 pp., about three times the EA-19 average. Denmark, the UK and Sweden show the most convergence with EA-19 and, along with Croatia and Czech Republic, these 5 countries

are also below the EA-19 average for this period. Poland, Bulgaria and Hungary show high average inflation differentials, especially when we compare with EA-19. Concerning the standard-deviation of each country for 1999-2007, the Non-EA EU28 average is about 1.5 times higher than EA-19. Romania continues to stand out with 12.45 pp., whereas Poland (0.2 pp.), shows the lowest volatility.

Regarding the OCA theory, and concerning this period, the old members of EU - Denmark, Sweden and the UK - and possibly the more recent members Croatia and Czech Republic, would be ready to join the EA, in light of this indicator especially when we consider that they show comparable averages and volatilities to those of the founding members. Accession of these countries to the Euro Area would be acceptable in light of the OCA theory.

Considering now the second period, 2008-2016, we can see that the Non-EA EU28 average is 1.24 pp.; the lowest average inflation differential is 0,35 pp. (Denmark) and the highest is 2.54 pp. (Romania). As we can see in Table 1 above, 3 countries are below the EA-19 average. Regarding each country's standard-deviation, for 2008-2016, the Non-EA EU28 average has also registered a reduction. In fact, this average is lower than the EA-19 average for the same period. With 0.18 pp., Hungary exhibits the lowest volatility and, with 0.81 pp., Romania shows the highest.

Similarly to what happened in the Euro Area, in 2008-2016, both average differentials (about one third) and volatility (about two thirds) have been reduced in the Non-EA EU28. Denmark, Czech Republic and Sweden show the lowest inflation differentials and are followed by the UK and Croatia. The highest average inflation differential and volatility still belong to Romania. However, we can see a remarkable improvement, not only with Romania, but also Poland, Bulgaria and Hungary – these last three countries saw their inflation differentials reduced by, at least, half. Considering both periods, we can observe that inflation differentials have had a positive evolution, with countries reducing both average differentials and standard-deviation. Both groups, EA-19 and Non-EA EU28, appear to be more similar in 2008-2016, than they were in 1999-2007.

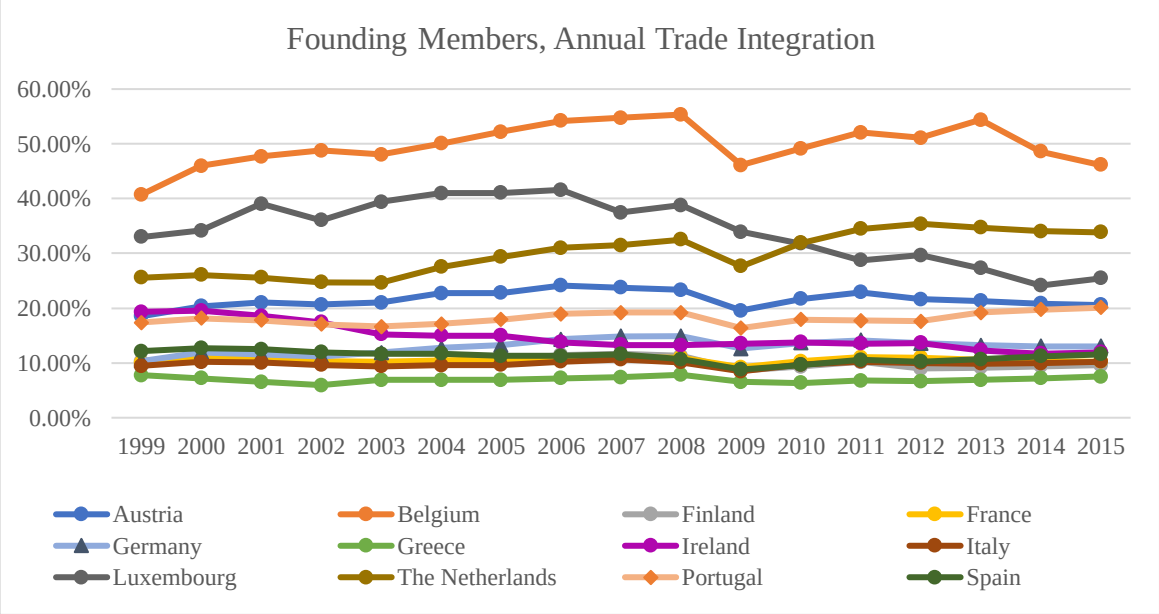
Regarding the OCA theory, this indicator appears to justify a possible accession of Czech Republic, Denmark and Sweden to the Euro Area, with these countries showing

average inflation differentials below the EA-19 average and volatility comparable to those of the current members of EA-19. The OCA theory could also justify the accession of the UK and Croatia.

4.2 Trade Integration

Considering the evolution of trade integration from 1999 to 2015, there are some countries that stand out (Figure 5). Concerning founding members, the continuously high trade integration of Belgium, The Netherlands and Luxembourg is clear in Figure 5, below. The consistently low levels for Greece are also evident. Concerning recent members (Figure 6), Estonia, Slovakia and Slovenia have had the highest trade with EA-19, while Cyprus clearly has been the less integrated member. All EA-19 countries have seen their values of trade integration reduced in 2009, by comparison to 2008 (Figure 5 and 6). This may be due to the effects of the 2008 global financial crisis in the Euro Area economies.

Figure 5 – Founding Members, Annual Trade Integration

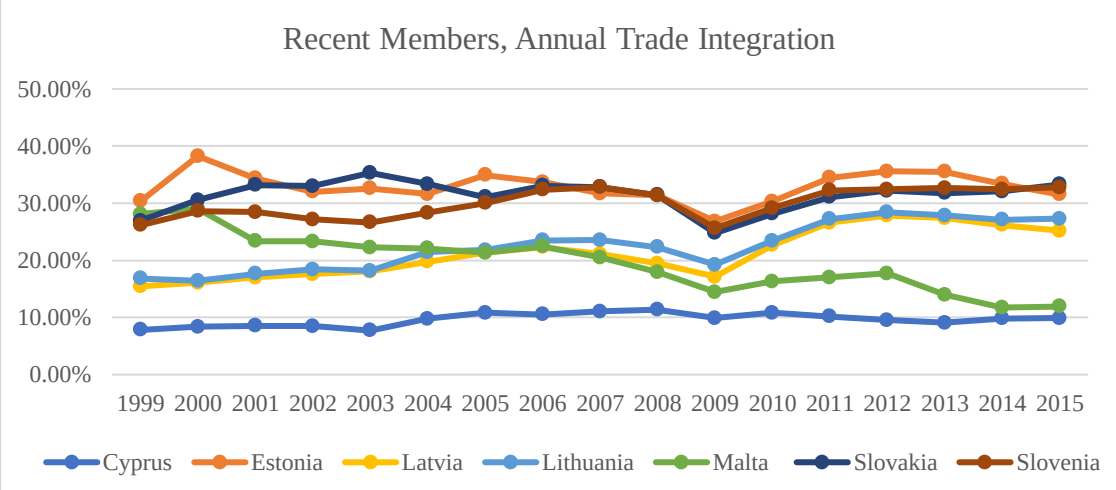


Source: Author's calculations on the basis of data from UNCTADstat (exports and imports), IMF World Economic Outlook (GDP)

Concerning Non-EA EU28 members, when we focus on the annual evolution of trade integration from 1999 to 2015, the same trend observed for the Euro Area members

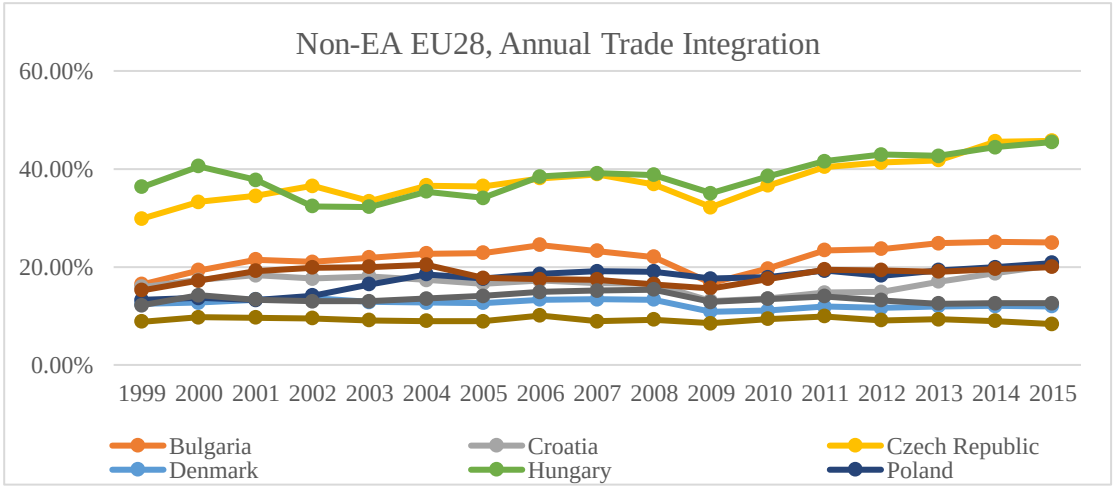
emerges (Figure 7, below). Trade integration of all countries falls in 2009 and, with the exception of Sweden and the UK, it starts falling in 2008. This may be once again explained by the 2008 global financial crisis and its effects on the economy and, particularly, on trade. Concerning this group of countries, Czech Republic and Hungary are the two countries which appear to be more integrated with EA-19, and the UK is clearly the less integrated country. Moreover, Hungary, Czech Republic, Bulgaria and even Poland appear to have witnessed an increase in integration in the second period.

Figure 6 – Recent Members, Annual Trade Integration



Source: Author's calculations on the basis of data from UNCTADstat (exports and imports), IMF World Economic Outlook (GDP)

Figure 7 – Non-EA EU 28 Members, Annual Trade Integration



Source: Author's calculations on the basis of data from UNCTADstat (exports and imports), IMF World Economic Outlook (GDP)

We will now analyse both periods, concerning average trade integration. Results for EA-19 members and Non-EA EU28 members are shown in Table 2, below.

Table 2 – Trade integration, EA–19 and Non-EA EU28 Members

Euro Area	Average Trade Integration with EA-19 (%)	
Founding Members	1999-2007	2008-2015
Austria	21.7%	21.5%
Belgium	49.2%	50.4%
Finland	10.7%	9.6%
France	10.6%	10.5%
Germany	12.5%	13.5%
Ireland	16.3%	13.0%
Italy	9.9%	9.8%
Luxembourg	38.1%	30.0%
The Netherlands	27.3%	33.1%
Portugal	17.8%	18.5%
Spain	11.9%	10.4%
Greece	7.0%	7.0%
Recent Members	1999-2007	2008-2015
Slovenia	29.0%	31.1%
Cyprus	9.2%	10.1%
Malta	23.6%	15.1%
Slovakia	32.1%	30.6%
Estonia	33.3%	32.4%
Latvia	18.8%	24.1%
Lithuania	19.8%	25.4%
EA-19 Average	21.0%	20.8%
Non-EA EU28	Average Trade Integration with EA-19 (%)	
	1999-2007	2008-2015
Bulgaria	21.5%	22.5%
Croatia	17.2%	16.1%
Czech Republic	35.3%	40.1%
Denmark	13.0%	11.8%
Hungary	36.2%	41.2%
Poland	16.0%	19.0%
Romania	18.3%	18.4%
Sweden	13.7%	13.3%
UK	9.3%	9.1%
Non-EA EU28 Average	20.1%	21.3%

Note: Simple unweighted average;

Source: Author's calculations on the basis of data from UNCTADstat (exports and imports), IMF World Economic Outlook (GDP)

Considering the first period, 1999-2007, regarding average trade integration, we can observe that the EA-19 average for this period is 21%; being 49,2% (Belgium) the highest value, and 7% (Greece) the lowest. We can also see that there are 8 EA countries with integration above the EA-19 average. Interestingly, 4 of these are founding members and the remaining 4 are recent members.

Concerning the founding members, Belgium stands out with trade integration that is more than double that of the EA-19 average. Luxembourg and The Netherlands also stand out for their large values. Luxembourg's trade integration is about 4/5 higher than the EA-19 average and The Netherlands is about 1/3 higher than the EA-19 average. With trade integration that is about half or less of the EA-19 average, we have Greece, Finland, France and Italy. Spain and Germany also show low trade integration, slightly higher than half of the EA-19 average. When we consider the size of the economies, the low values of Germany, France, Italy and even Spain may not be that surprising. However, considering this indicator in light of the OCA theory, the low integration of Greece and Finland is more unsettling. Regarding recent members, Slovakia, Slovenia and Estonia show trade integration about 1/2 higher than the EA-19 average. Cyprus, on the other hand, is below the EA-19 average.

Regarding this indicator, it is clear that there is a large disparity among countries for this time period. Greece, followed by Cyprus and Italy - and even France and Finland - show trade integration that amounts to roughly half of the EA-19 average. Moreover, it is also worth highlighting that some recent members, which did not participate in the EA at the time, showed integration that surpassed that of current members and would be able to possibly partake in the EA sooner (*e.g.*, comparing Estonia to Greece). Nonetheless, the majority of the remaining members show high levels of trade integration with EA-19 and, in light of the OCA theory and this indicator, may be closer to forming an OCA.

Regarding the second period, 2008-2015, the EA-19 average is now 20.8%. The highest value of trade integration is 50.4% (Belgium) and the lowest is 7% (Greece). Both countries continue to stand out, but for different reasons. For this period, we have now 9 countries with trade integration above the EA-19 average and Portugal is fairly close, with 18.5%. Considering the founding members, Belgium, The Netherlands and Luxembourg are still the countries that are most integrated with the EA-19. However,

Luxembourg, along with Ireland, have seen a reduction in trade integration of around 1/5 each. Considering recent members, Latvia and Lithuania show the biggest increases in trade integration, of more than 1/4 each, while Malta has experience a reduction in trade integration of 1/3.

When we compare the two periods, we come to the conclusion that, regarding this indicator, they appear to be very similar. There are still signs of large disparities between members. Although there is a positive evolution of trade integration for many countries, there are a few that maintain levels well below the EA-19 average. The majority of founding members also seem to be consistently below the EA-19 average. Recent members, overall, appear to have higher levels of integration than the founding members. The seemingly small trade integration showed by some members (*e.g.* Greece, Finland and Italy) may be sufficient to make us question their membership in the EA, in what concerns this indicator. Thus, in light of the OCA theory, the Euro Area as a whole appears to have maintained a similar performance in both periods, regarding this indicator, and we cannot conclude whether it is closer or farther from being an OCA.

In respect to the Non-EA EU28 members (Table 2, above) and considering the first period, 1999-2007, the average trade integration for Non-EA EU28 members is only slightly lower than the average of the EA-19, with Hungary (36.2%) and Czech Republic (35.3%) being the most integrated and the UK (9.3%) the least integrated. Having in mind the values for the EA members during this period, regarding this indicator, all Non-EA EU28 members seem to be as adequate as most of them to belong to the EA, in light of the OCA theory – especially if we keep in mind the low integration of Greece, Cyprus and Italy for this time period.

Focusing now on the second period, 2008-2015, Hungary (41.2%) and Czech Republic (40.1%) continue to show the highest integration with EA-19, while The UK has the lowest (9.1%). When we compare both periods, we conclude that Hungary, Czech Republic and Bulgaria show trade integration above the EA-19 average for both periods. Poland, although being below EA-19's average, shows a considerable increase, of around 18,5%. All Non-EA EU28 members are more integrated with the EA than Greece, during both periods – this leads us to conclude that, considering this indicator, all Non-EA EU28 members are more prepared to join the EA than Greece that is an actual member, or,

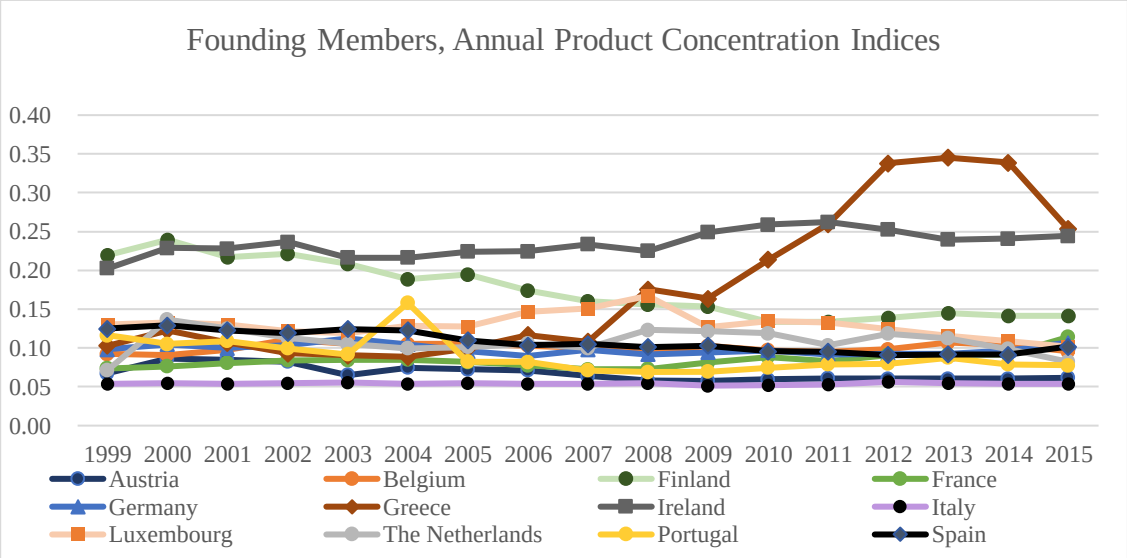
Greek accession and membership in the EA could possibly be questioned. On the basis of this indicator, and considering the OCA theory, these results suggest that Bulgaria, Czech Republic and Hungary are the countries that seem to be the most prepared to join the Euro Area, having successfully increased integration throughout our sample, despite the 2008 global crisis.

4.3 Export Diversification

Concerning the annual evolution of each countries Concentration Indices (Figures 8 and 9) the first observation that stands out is that Malta is the least diversified member of EA-19. All other countries seem to be scoring below 0.3, with the exception of Greece for 2012, 2013 and 2014 and Cyprus (1999). The Euro Area members, in general, appear to be well diversified in terms of exports.

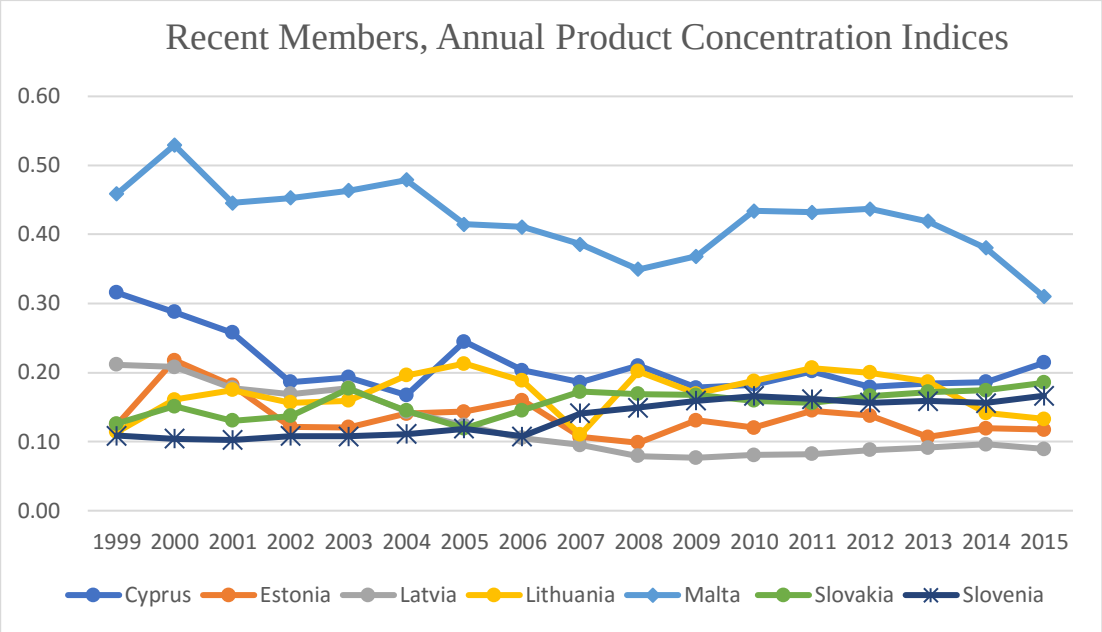
Regarding the annual evolution of the Product Concentration Indices of Non-EA EU28 members, all of these present values below 0.16 for the entire length of the sample, 1999-2015 (Figure 10, below). The Non-EA EU28 members appear to be highly export-diversified.

Figure 8 – Founding Members, Annual Product Concentration Indices



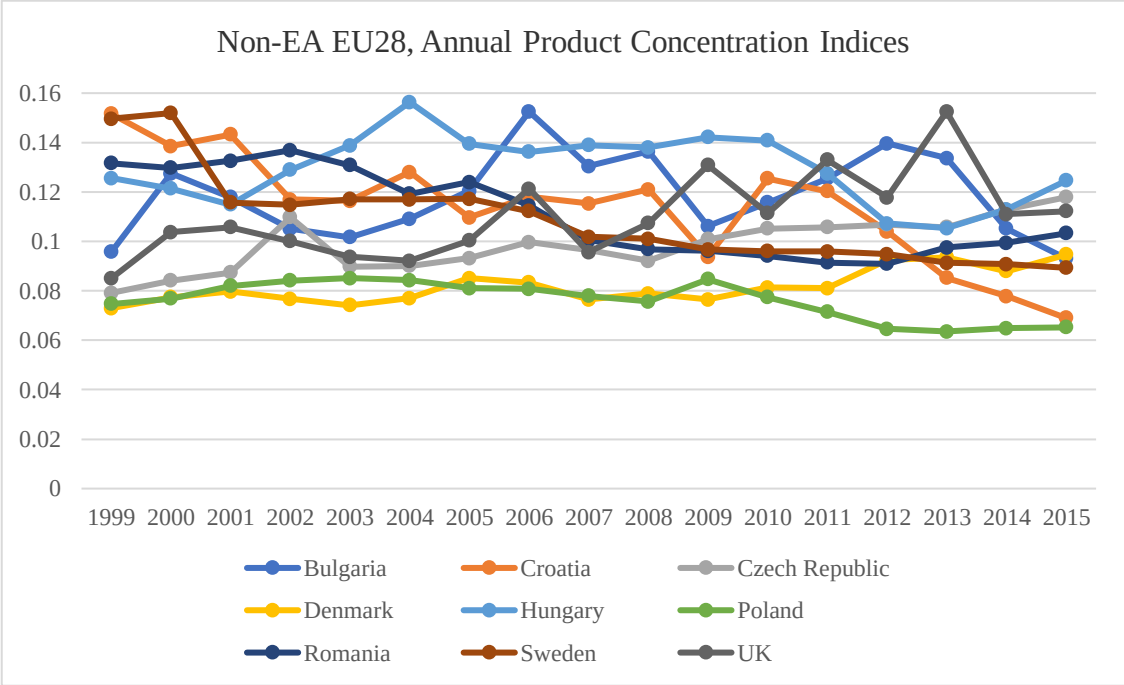
Source: Product Concentration Indices available at UNCTADstat

Figure 9– Recent Members, Annual Product Concentration Indices



Source: Product Concentration Indices available at UNCTADstat

Figure 10 – Non-EA EU28, Annual Product Concentration Indices



Source: Product Concentration Indices available at UNCTADstat

We will now analyse the average diversification of each country, for the two time periods, 1999-2007 and 2008-2015. Results for both EA-19 members and Non-EA EU28 members are presented in Table 3, below.

Table 3 – Product Concentration Indices, EA– 19 and Non– EA EU28 Members

Euro Area	Average Product Concentration Index	
Founding Members	1999-2007	2008-2015
Austria	0.07	0.06
Belgium	0.10	0.10
Finland	0.20	0.14
France	0.08	0.09
Germany	0.10	0.10
Ireland	0.22	0.25
Italy	0.05	0.05
Luxembourg	0.13	0.13
The Netherlands	0.11	0.11
Portugal	0.10	0.08
Spain	0.12	0.10
Greece	0.10	0.26
Recent Members	1999-2007	2008-2015
Slovenia	0.11	0.16
Cyprus	0.23	0.19
Malta	0.45	0.39
Slovakia	0.14	0.17
Estonia	0.15	0.12
Latvia	0.16	0.09
Lithuania	0.16	0.18
EA-19 Average	0.15	0.14
Non-EA EU28	**Average Product Concentration Index**	
	1999-2007	2008-2015
Bulgaria	0.12	0.12
Croatia	0.13	0.10
Czech Republic	0.09	0.11
Denmark	0.08	0.09
Hungary	0.13	0.12
Poland	0.08	0.07
Romania	0.12	0.10
Sweden	0.12	0.09
UK	0.10	0.12
Non-EA EU28 Average	0.11	0.10

Note: Simple unweighted average.

Source: Author's calculations on the basis of data from UNCTADstat

Regarding the first period, 1999-2007, it becomes very clear that, overall, the Euro Area members have very diversified export structures. We can observe that the EA-19 average is 0.15, with Italy (0.05), Austria (0.07) and France (0.08) being the more diversified and with Malta (0.45) showing less diversification. As shown in Table 3, there are 13 countries below the EA-19 average, with Latvia and Lithuania being very close to the EA-19 average. Founding members and recent members appear to be very similar, with most showing diversified exports. Concerning this period, and regarding the OCA theory, the EA-19 countries appear to be rather uniform, with high levels of export diversification. Of all the EA-19 countries, Malta is the least diversified, which, in light of this indicator, would mean that possibly should not belong to the EA – this in turn is consistent with this countries' position given that, at the time, it was not a member. The homogeneity observed among members may also have positive implications regarding their positioning as an OCA, considering this indicator.

Focusing now on the second period, 2008-2015, the EA-19 average is 0.14, with Italy (0.05) and Austria (0.06) showing the most diversification of exports and with Malta (0.39) showing the least. As shown in Table 3, there are still 13 countries below the EA-19 average. Founding members and recent member continue to show very little differences between both groups. Regarding the founding members of Euro Area, Greece and Ireland are the least diversified countries of this group. When we consider both periods, they are overall very similar. Greece appears to stand out, with an increase of concentration of about 1.5 times. Overall, the majority of countries appear to be quite diversified, in terms of exports. In conclusion, in terms of export diversification, Euro Area members already exhibited high levels of diversification. However, some countries stand out regarding their increased diversification (*e.g.*, Latvia and Finland). Overall, regarding this indicator, the Euro Area seems to be closer to an OCA in 2008-2015, even if the export diversification of some of its members clearly went in the other direction.

The Non-EA EU28 members, for the first period in our sample, also appear to have very diversified exports (Table 3, above). We can observe that the Non-EA EU28 average is 0.11, with Denmark (0.08) and Poland (0.08) being the more diversified and with Croatia (0.13) and Hungary (0.13) showing higher indices. All Non-EA EU28 members are more diversified than the average EA-19 members. Therefore, regarding

this indicator and the theory of OCA, all Non-EA EU28 members would be more prepared to join Euro Area than some of the current members, in this period.

In what concerns 2008-2015, we can observe that the Non-EA EU28 average is 0.10, with Poland (0.07), Denmark (0.09) and Sweden (0.09) being the more diversified and with Bulgaria (0.12), Hungary (0.12) and the UK (0.12) showing higher indices. The Non-EA EU28 members are still highly diversified and even more than some of the EA-19 members. Keeping this in mind, for this time period and considering this indicator, the remaining EU28 members would be able to proceed with accession into Euro Area.

4.4 Business Cycles Synchronisation

We will now analyse the average business cycle synchronisation of each country, for the two time periods, 1999-2007 and 2008-2016. The results for both EA-19 members and Non-EA EU28 members are presented in Table 4, below.

Regarding the Euro Area members, for 1999-2007, we can observe that the EA-19 average is 0.62, with 0.12 (Lithuania) being the lowest correlation and 0.94 (Italy) the highest. As expected, with the exception of Greece, all the founding members are more correlated with EA-19, than recent members. This is possibly due to the fact that recent members were still in a process of convergence, since, at the time, they were not members of the EA. The majority of the Euro Area founders appear to show high levels of correlation with the currency area, for the first period. Therefore, these countries appear to be closer to an OCA, than recent members, in 1999-2007. Greece, however, appears to show more similarities with the recent members, than with its own group.

Table 4 – Business Cycles Correlations, EA and Non– EA EU28 Members

Euro Area	Average Business Cycle Correlation with EA-19	
Founding Members	1999-2007	2008-2016
Austria	0.90	0.84
Belgium	0.77	0.96
Finland	0.90	0.93
France	0.83	0.94
Germany	0.93	0.69
Ireland	0.85	0.47
Italy	0.94	0.96
Luxembourg	0.83	0.86
The Netherlands	0.84	0.98
Portugal	0.67	0.72
Spain	0.59	0.74
Greece	0.36	0.49
Recent Members	1999-2007	2008-2016
Slovenia	0.51	0.93
Cyprus	0.51	0.67
Malta	0.29	0.54
Slovakia	0.39	0.93
Estonia	0.35	0.60
Latvia	0.29	0.47
Lithuania	0.12	0.65
EA-19 Average	0.62	0.76
Non-EA EU28	Average Business Cycle Correlation with EA-19	
	1999-2007	2008-2016
Bulgaria	0.09	0.95
Croatia	0.45	0.86
Czech Republic	0.45	0.97
Denmark	0.66	0.94
Hungary	0.01	0.82
Poland	0.66	0.57
Romania	-0.09	0.82
Sweden	0.77	0.82
UK	0.50	0.56
Non-EA EU28 Average	0.39	0.81

Note: Simple unweighted average

Source: Author's calculations on the basis of data from AMECO Database (output gaps)

Concerning the following period, 2008-2016, the EA-19 average is 0.76, the lowest correlation is 0.47 (Ireland and Latvia), and the highest correlation is 0.98 (The Netherlands). We can see that, comparing with the first period, the EA-19 average business cycle correlation has increased. Greece, although being under the EA-19-

average, has had a considerable increase in business cycle synchronisation. However, Ireland has experienced the opposite, with a drastic reduction. Recent members registered the higher increases of business cycles correlation - Lithuania (more than 4 times as much), Slovakia (about 1.3 times as much) and even Slovenia (about 5/6) stand out. Analysing both periods, we can clearly see that there was an overall tendency for increasing business cycles correlation, by comparison with the previous period. In conclusion, regarding the correlation of business cycles, the Euro Area as a whole appears to be closer to an OCA after the recent crises. This is in line with the "endogeneity hypothesis" of Frankel and Rose (1998). Moreover, the effects of the 2008 global financial crisis may have had an impact in driving business cycles closer, even if those effects may have had negative consequences for economic growth.

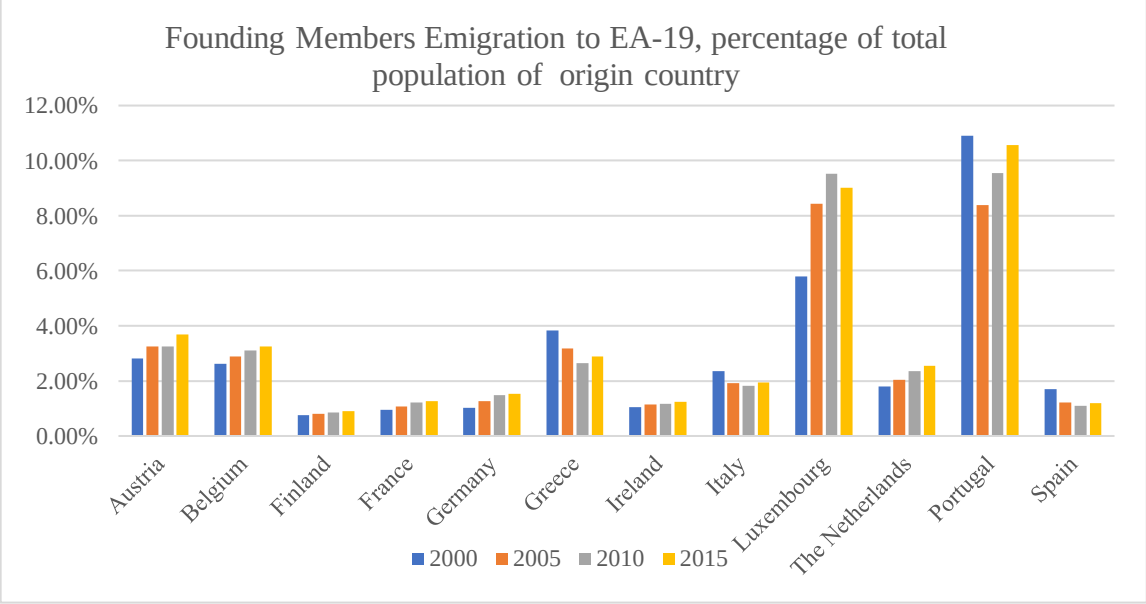
Considering the remaining EU28 members (Table 4, above), for 1999-2007, we can observe that the Non-EA EU28 average is 0.39, well below the EA-19 average. Sweden appears to be the most correlated of these countries (0.77), while the Romanian business cycle is clearly not synchronized with the Euro Area (-0.09). For this period, we can see a large disparity among the Non-EA EU28 members. Nonetheless, Sweden, Poland and Denmark could be potential candidates for accession, given that they show values that are above the EA-19 average business cycle correlation.

Turning now to the analysis of the second period, the Non-EA EU28 average is now 0.81; Czech Republic (0.97), Bulgaria (0.95) and Denmark (0.94) are the most synchronised with EA-19, and the UK shows the smallest correlation (0.56). The Non-EA EU28 average has not only doubled in this period, but it is now slightly higher than the EA-19 average for 2008-2016. Hungary, Romania and Bulgaria show astonishing increases, and are now as synchronised as the most correlated EA members. Therefore, in light of this indicator, these last three countries could become members of the EA. Considering both periods, the remaining Non-EA EU28 members seem to follow a similar trend to the Euro Area members, with some even surpassing the synchronisation of current members and, therefore, being possibly more prepared to join the EA rather than some of its current members (*e.g*, comparing Czech Republic, Bulgaria and Denmark, among others, against Ireland, Latvia and Greece).

4.5 Labour Mobility

We will now analyse labour mobility, using emigration to EA-19 as proxy. When it comes to emigration, Euro Area members show very diverse values among themselves along the 4 years analysed. Concerning the founding members (Figure 11, below), Portugal and Luxembourg stand out by having the highest rates of emigration to EA-19, for the 4 years under our analysis. Of this group, Finland, France, Germany, Ireland and Spain registered the lowest emigration to EA-19, with rates being consistently lower than 2%, throughout these years. Regarding the recent members (Figure 12, below), Malta stands out with the lowest emigration to EA-19 during these 4 years, with rates always lower than 2%. Of this group, Estonia and Lithuania show the highest emigration to EA-19, although with values considerably lower to those of Portugal and Luxembourg. Keeping in mind the OCA theory, we can see that, with some rare and possibly even surprisingly exceptions (Greece, Italy, Spain and Cyprus), emigration appear to have seen an increase after the beginning of the global financial crisis. This is clearly visible in the case of Portugal but also in the Baltic countries, for example.

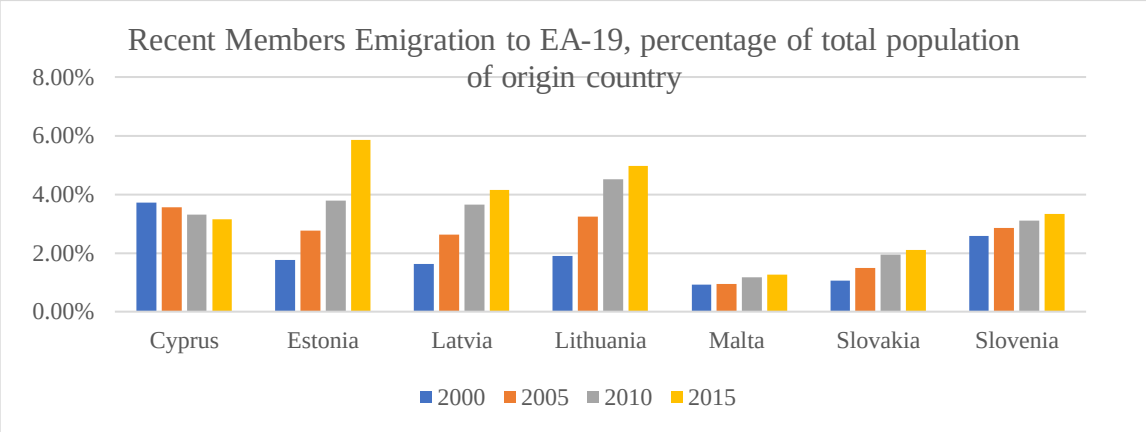
Figure 11 – Founding Members Emigration to EA-19



Source: Author's calculations on the basis of data from UN Migrant Stock by Origin and Destination report

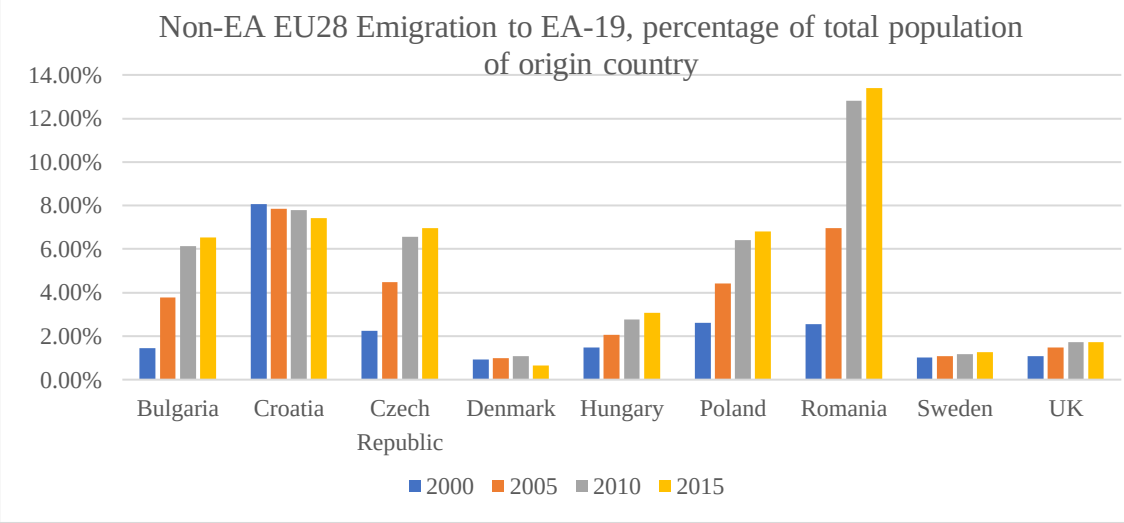
Concerning the Non-EA EU28 members (Figure 13, below), Romania clearly shows the highest emigration to EA-19, in the most recent years. Croatia, Czech Republic, Poland and Bulgaria also seem to show high levels of emigration to EA-19. Denmark, Sweden and the UK are clearly the countries with the lowest levels, throughout these 4 years, with their emigration to EA-19 being consistently below 2%, during the sample period. Once again, in light of the OCA theory, and with the exception of Croatia and possibly Denmark, there seems to be an increase in emigration after the beginning of the global financial crisis.

Figure 12 – Recent Members Emigration to EA-19



Source: Author's calculations on the basis of data from UN Migrant Stock by Origin and Destination

Figure 13 – Non-EA EU28 Emigration to EA-19



Source: Author's calculations on the basis of data from UN Migrant Stock by Origin and Destination

We will now analyse the averages for our two time periods: 2000-2005 and 2010-2015, and for both EA-19 and Non-EA EU28 members, which are presented in Table 5, below.

Table 5 – Emigration to EA– 19, EA and Non– EA EU28 Members

Euro Area	Average Emigration to EA-19	
Founding Members	2000-2005	2010-2015
Austria	3.04%	3.47%
Belgium	2.75%	3.18%
Finland	0.78%	0.87%
France	1.01%	1.23%
Germany	1.15%	1.52%
Ireland	1.09%	1.21%
Italy	2.14%	1.88%
Luxembourg	7.11%	9.27%
The Netherlands	1.92%	2.46%
Portugal	9.64%	10.05%
Spain	1.46%	1.14%
Greece	3.51%	2.77%
Recent Members	2000-2005	2010-2015
Slovenia	2.73%	3.21%
Cyprus	3.64%	3.23%
Malta	0.93%	1.22%
Slovakia	1.27%	2.03%
Estonia	2.26%	4.81%
Latvia	2.12%	3.90%
Lithuania	2.57%	4.75%
EA-19 Average	2.69%	3.27%
Non-EA EU28	**Average Emigration to EA-19**	
	2000-2005	2010-2015
Bulgaria	2.61%	6.33%
Croatia	7.97%	7.61%
Czech Republic	3.36%	6.76%
Denmark	0.95%	0.85%
Hungary	1.77%	2.91%
Poland	3.51%	6.61%
Romania	4.76%	13.10%
Sweden	1.04%	1.21%
UK	1.27%	1.72%
Non-EA EU28 Average	3.03%	5.23%

Note: Simple unweighted average

Source: Author's calculations on the basis of data from UN Migrant Stock by Origin and Destination report

Concerning the first period, 2000-2005, we can observe that the EA-19 average is 2.69%, with 9.64% (Portugal) being the highest emigration rate and 0.78% (Finland) the lowest. Portugal and Luxembourg registered the highest levels of emigration, and both are also smaller countries. Regarding the founding members of the Euro Area, five are above the EA-19 average. Regarding recent members, only two are above that average. However, when we exclude Portugal and Luxembourg, recent members appear to be more mobile than founding members – there are only two recent members with emigration rates below 2% (Malta and Slovakia), whereas there are six founding members below that same rate (Finland, France, Germany, Ireland, The Netherlands and Spain). Hence, when we regard this period, and consider the OCA theory, recent members seemed to be more mobile and therefore more prepared to belong to this currency area. This is interesting, especially when we keep in mind that recent members were not part of the EA at the time.

In regards to the second period, 2010-2015, we can observe that the EA-19 average is 3.27%, with emigration to EA-19 ranging from 10.05% (Portugal) to 0.87% (Finland). There are three founding members and three recent members above the EA-19 average, but Belgium, Slovenia and Cyprus are close to that value. Regarding founding members, Luxembourg and The Netherlands saw an increase of around one third. In respect to recent members, in this period, Estonia more than doubled its emigration rate and Latvia and Lithuania increased slightly over 1.8 times as much. In light of the OCA theory, and considering both periods, the majority of Euro Area members, with a few exceptions, appear to have increased emigration after the beginning of the crisis, which would mean that the adjustment mechanism proposed by Mundell (1961) manifested itself – therefore, the Euro Area may be closer to the concept of an OCA, regarding labour mobility.

Concerning the Non-EA EU28 members, for 2000-2005, their average emigration is 3.03%, with Croatia (7.97%) showing the highest value and Denmark (0.95%) showing the lowest. However, the Non-EA EU28 average is higher than EA-19's - there are four countries above both averages, and Bulgaria comes very close to the EA-19 average. Overall, the Non-EA EU28 members appear to show comparable values to those of the Euro Area members, concerning this indicator.

Regarding the second period, 2010-2015, the Non-EA EU38 average is 5.23%, with emigration values ranging from 0.85% (Denmark) through 13.10% (Romania). We can

observe that the Non-EA EU28 average has increase around 1.75 times, and comparing with the EA-19 average, the former is higher. There are five countries above both averages. Romania, Bulgaria and Czech Republic have seen their emigration to EA-19 more than doubled, in this time period. Denmark, Sweden and the UK remain the Non-EA EU28 countries with the lowest emigration to EA-19. However, overall, these countries show levels of emigration comparable to the current EA-19 members and therefore, in light of the OCA theory and considering this indicator, all of the Non-EA EU28 members could possibly participate in the currency area.

Conclusions

In this dissertation we analysed the Euro Area, in light of the OCA theory, and considering the turbulent years it has recently experienced. No doubt the recent crises have put the Euro Area to the test, exposing some fragilities. We have also analysed the preparedness of other EU members to integrate the Euro Area. Overall, the analysis of 5 indicators, suggested by the OCA theory, appear to point to convergence between members. After all that has happened post-2008, including both crises, overall, the Euro Area does not seem to be driven further from an OCA, with some indicators actually suggesting a tendency for it to become closer to an OCA. Moreover, this seems to be case also when one consider the other EU members.

Concerning the Euro Area members, inflation differentials are found to have had a positive evolution, with averages and standard-deviations showing a reduction after 2008, and with founding and recent members becoming less dispersed. Business cycles have also become more synchronised in the second period, especially considering the evolution of recent members. Labour mobility has also registered a positive evolution, especially after the beginning of the global financial crisis. Regarding trade integration and export diversification there do not appear to be considerable differences between the two periods. There are, however, large disparities of trade integration between members.

When it comes to the Euro Area countries that were more affected by the crises, in particular the group commonly referred to in the literature as PIIGS, there seems to be mixed results regarding our five indicators. Italy appears to be the most integrated country with the Euro Area. In fact, Italy is one of the Euro Area members with the lowest average inflation differentials and highest business cycles correlation, for example. Portugal also appears to be aligned with Euro Area, showing convergence in all indicators. Ireland and Spain perform better in some indicators than others. Greece, however, appears to be consistently on the lower end of these indicators. For example, Greece is the member country which trades less with the Euro Area and its synchronisation with the Euro Area is well below average. These results may make us question Greece's membership, in light of the OCA theory: Greece, with these lower scores may have been better off out of the Euro Area.

Regarding the Non-EA EU28 members, when it comes to inflation differentials, these countries show a similar evolution to the Euro Area, and also comparable values. Concerning business cycles synchronisation, correlation with the Euro Area has increased in the second period and, concerning labour mobility, the period marked by the crisis has seen an increase of emigration to the Euro Area. When it comes to trade, Non-EA EU28 members show similar values to most current EA members and, without exception, all show higher integration than Greece for both periods. Finally, these countries also display very diversified exports structures, similar to the Euro Area members. Depending on the indicator under analysis, some Non-EA EU28 members could be recommended to join the currency area – a couple that are often more aligned with the Euro Area are, for example, Czech Republic and Croatia.

Another pertinent result are the similar values of Greece and the UK – with the UK even scoring higher in some indicators. In light of the OCA theory, this is a very interesting result especially when we consider the opposite positions of both countries, with Greece being an actual member of the Euro Area and with the UK preparing to leave EU. Therefore, according to the OCA theory, this finding would lead to the conclusion that, according to almost all the criteria, Greece is less adequate to be part of the Euro Area than the UK might be and, thus, Greece's membership could be questioned.

While our analysis does not aim to conclude whether or not the Euro Area constitutes an OCA, we can, however, conclude that after being put to the test, having to deal with two back-to-back crises, affecting members in different ways, the Euro Area is, overall, closer to an OCA.

We are aware of the limitations of this study. Our analysis does not test the potential effects of the crises in the behaviour of the indicators studied, which does not allow us to conclude on the role of the crisis for their behaviour. Although suggested by the OCA theory, the indicators used in this dissertation assess different aspects that are important to the theory. However, some aspects are clearly hard to capture with one single indicator – for example, labour mobility. So, our results are dependent on the ability of the indicators used to grasp the aspects suggested by the theory. Moreover, by concentrating on a given number, we may leave out other relevant aspects: for example, given the rise of Euroscepticism, a potentially important element may be political will.

The role of political will is an aspect also worth being studied in this context, which would contribute towards explaining the behaviour of the Euro Area as an OCA. This type of analysis could also be extended to candidates and potential candidates of EU, in order to compare them with current Euro Area and EU members, in light of the OCA theory.

References

Artis, M. J. and Zhang, W. (2002), "Membership of EMU: A Fuzzy Clustering Analysis of Alternative Criteria", *Journal of Economic Integration*, Vol. 17, No. 1, pp. 54-79;

Alesina, A., Ardagna, S. and Galasso, V. (2008), "The Euro and Structural Reforms", NBER Working Paper, No. 14479, November;

Alesina, A., Barro, R. J. and Tenreyro, S. (2002), "Optimal Currency Areas", in M. Gertler and K. Rogoff (editors), *NBER Macroeconomics Annual 2002*, Vol. 17, MIT Press, pp. 301-356;

Andrade, J. S. and Duarte, A. P. (2015), "Optimum Currency Areas, Real and Nominal Convergence in the European Union", *Notas Económicas*, Faculdade de Economia, Universidade de Coimbra, No.42, pp. 8-29;

Arpaia, A. and Pichelmann, K. (2007), "Nominal and Real Wage Flexibility in EMU", *International Economics and Economic Policy*, Vol. 4, No. 3, pp. 299-328;

Baptista, E. (2015), *Uma União Monetária para a África Ocidental?* Porto. Universidade do Porto. Master Dissertation in Economics;

Barbosa, J. R. and Alves, R. H. (2011), "The Euro Area Ten Years after Its Creation: (Divergent) Competitiveness and the Optimum Currency Area", *Panoeconomicus*, Vol. 58, No. 5, pp. 605-629;

Bayoumi, T. and Eichengreen, B. (1992), "Shocking Aspects of European Monetary Unification", *NBER Working Paper No. 3949*, January 1992;

Bayoumi, T. and Eichengreen, B. (1994), "One Money or Many? Analyzing the Prospects for Monetary Unification in Various Parts of the World", *Princeton Studies in International Finance*, No. 76, September 1994;

Bayoumi, T. and Eichengreen, B. (1997), "Ever Closer to Heaven? An Optimum-Currency-Area Index for European Countries", *European Economic Review*, Vol. 41, No. 3-5, pp. 761-770;

Bayoumi, T. and Prasad, E. (1997), "Currency Unions, Economic Fluctuations and Adjustments: Some Empirical Evidence", *International Monetary Fund Staff Papers,* Vol. 44, No. 1, pp. 36-58;

Beckworth, D. (2010), "One Nation Under the Fed? The Asymmetric Effects of US Monetary Policy and its Implications for the United States as an Optimal Currency Area", *Journal of Macroeconomics,* Vol. 32, No. 3, pp. 732-746;

Beine, M., Candelon, B. and Sekkat, K. (2003), "EMU Membership and Business Cycle Phases in Europe: Markov-Switching VAR Analysis", *Journal of Economic Integration,* Vol. 18, No. 1, pp 214-242;

Bun, M. J. G. and Klaassen, F. J. G. M. (2002), "Has the Euro Increased Trade?", *Tinbergen Institute Discussion Paper* No. 02-108/02;

Campolimi, A and Faia, E. (2011), "Labor Market Institutions and Inflation Volatility in the Euro Area", *Journal of Economic Dynamics and Control,* Vol. 35, No. 5, pp. 793-812;

Chojnicki, X., Edo, A. and Ragot, L. (2016), "Intra-European Labour Migration in Crisis Times", *CEPII Policy Brief,* No. 13, October;

Chupp, B. A. (2016), "Monetary Decentralization in the United States: is There a Case for Multiple Currencies?", *Journal of Economic Studies*, Vol. 43, No. 4, pp. 535-548;

Danthine, JP., Giavazzi, F. and von Thadden, EL. (2001), "The Effect of EMU on Financial Markets: A First Assessment" in C. Wyplosz (editor), *The Impact of EMU on Europe and the Developing Countries,* Oxford University Press, UK, pp. 225-268;

De Grauwe, P. (2012), *Economics of Monetary Union*, 9th Edition, Oxford: Oxford University Press;

De Grauwe, P. and Mongelli, F. P. (2005), "Endogeneities of Optimum Currency Areas: What Brings Countries Sharing a Single Currency Closer Together?", *European Central Bank Working Papers Series*, No. 468, April, European Central Bank (ECB);

De Nardis, S. and Vicarelli, C. (2003), "The Impact of the Euro on Trade. The (Early) Effect is Not So Large", *European Network of Economic Policy Research Institutes (ENEPRI) Working Paper*, No. 17, February;

Degiannakis, S., Duffy, D., Filis, G. and Livada, A. (2016), "Business Cycle Synchronisation in EMU: Can Fiscal Policy Bring Member-Countries Closer?", *Economic Modelling*, Vol. 52, pp. 551-563;

Dufrénot, G. and Keddad, B. (2014), "Business Cycles Synchronization in East Asia: A Markov-Switching Approach", *Economic Modelling*, Vol. 42, pp. 186-197;

Emerson, M., Gros, D., Italianer, A., Pisani-Ferry, J. and Reichenbach, H. (1990), "One Market, One Money – An Evaluation of the Potential Benefits and Costs of Forming an Economic and Monetary Union", *European Economy*, No. 44;

Fidrmuc, J. and Korhonen, I. (2003), "Similarity of Supply and Demand Shocks Between the Euro Area and the CEECs", *Economic Systems*, Vol. 27, No. 3, pp. 313-334;

Fleming, M. J. (1971), "On Exchange Rates Unification", *The Economic Journal*, Vol. 81, No. 323, pp. 467-488;

Frankel, J. A. and Rose, A. K. (1998), "The Endogeneity of the Optimum Currency Area Criteria", *The Economic Journal*, Vol. 108, No.449, pp. 1009-1025;

Fratzscher, M. and Stracca, L. (2009), "The Political Economy under Monetary Union: Has the Euro Made a Difference?", *Economic Policy*, Vol. 24, No. 58, pp. 307-348;

Frenkel, M. and Nickel, C. H. (2002), "How Symmetric are the Shocks and the Shock Adjustment Dynamics Between the Euro Area and Central and Eastern European Countries?", *The International Monetary Fund Working Paper*, No. 02/222, December 2002;

Gros, D. (1996), "A Reconsideration of the Optimum Currency Approach: The Role of External Shocks and Labour Mobility", *National Institute Economic Review*, Vol. 158, No. 1, pp. 108-127;

Hall, S. G. and Lagoa, S. (2014), "Inflation and Business Cycle Convergence in the Euro Area: Empirical Analysis Using an Unobserved Component Model", *Open Economies Review*, Vol. 25, No. 5, pp. 885-908

Hein, E. and Truger, A. (2005), "European Monetary Union: Nominal Convergence, Real Divergence and Slow Growth?", *Structural Change and Economic Dynamics*, Vol. 16, No. 1, pp. 7-33;

Houssa, R. (2004), "Monetary Union in West Africa and asymmetric Shocks: a Dynamic Structural Factor Model", Katholieke Universiteit Leuven, *Center for Economic Studies*, Discussions Paper Series No. 0411;

Hsu, H-F. (2010), "Is a Common Currency Area Feasible for East Asia? A Multivariate Structural Vector Autoregression Aproach", *Asian Economic Journal*, Vol. 24, No. 4, pp. 391-411;

Ishiyama, Y. (1975), "The Theory of Optimum Currency Areas: A Survey", *International Monetary Fund (IMF) Staff Papers*, Vol. 22, No. 2, July, pp. 344-383;

Issing, O. (2000), "Europe: Common Money – Political Union?", *Economic Affairs*, Vol. 20, No. 1, pp. 33-39;

Jager, J. and Hafner, K. A. (2013), "The Optimum Currency Area and the EMU: An Assessment in the Context of the Eurozone Crisis", *Intereconomics*, Vol. 48, No. 5, pp. 315-322;

Kempa, B. (2002), "Is Europe Converging to Optimality? On Dynamic Aspects of Optimum Currency Areas", *Journal of Economic Studies*, Vol. 29, No. 2, pp. 109-120;

Kenen, P. B (1969), "The Theory of Optimum Currency Areas: An Eclectic View", in R. A. Mundell and A. K. Swoboda (editors), *Monetary Problems of the International Economy*, University of Chicago Press, USA, pp. 41-60;

Kunroo, M. H., Sofi, I. A. and Azad, N. A. (2016), "Trade Implications of the Euro in EMU Countries: a Panel Gravity Analysis", *Empirica*, Vol. 43, No. 2, pp. 391-413;

Krugman, P. (1993), "Lessons of Massachusetts for EMU", in F. Torres and F. Giavazzi (editors), *Adjustment and Growth in the European Monetary Union*, Cambridge University Press, UK, pp. 241-261;

Krugman, P. (2012), "Revenge of the Optimum Currency Area", in D. Acemoglu, J. Parker and M. Woodford (editors), *NBER Macroeconomics Annual 2012*, Vol. 27, University of Chicago Press, pp. 439-44.

Lane, P. R. (2006), "The Real Effects of EMU", *Journal of Economic Perspectives*, Vol. 20, pp. 47-66;

Lee, G. H. Y. and Azali, M. (2012), "Is East Asia an Optimum Currency Area?", *Economic Modelling*, Vol. 29, pp- 87-95;

Lehwald, S. (2013), "Has the Euro Changed Business Cycle Synchronization? Evidence From the Core and the Periphery", *Empirica*, Vol. 40, No. 4, pp. 655-684

Loureiro, J., Martins, M. M. F. and Ribeiro, A. P. (2012), "Anchoring to the Euro (and Grouped Together)? The Case of African Countries", *Journal of African Economies*, Vol. 21, No. 1, pp. 28-64;

Loureiro, J., Martins, M. M. F. and Ribeiro, A. P. (2010), "Cape Verde: The Case for Euroisation", *South African Journal of Economics*, Vol. 78, No. 3, pp. 248-268;

Masini, F. (2014), "A History of the Theories on Optimum Currency Areas", *The European Journal of the History of Economic Thought*, Vol. 21, No. 6, pp. 1015-1038;

Matthes, J. (2009), "Ten Years EMU – Reality Test for the OCA Endogeneity Hypothesis, Economic Divergences and Future Challenges", *Intereconomics*, Vol. 44, No. 2, pp. 114-128;

McKinnon, R. I. (1963), "Optimum Currency Areas", *The American Economic Review*, Vol. 53, No. 4, pp. 717-725;

Mélitz, J. (1995), "The Current Impasse in Research on Optimum Currency Areas", *European Economic Review*, Vol. 39, No. (3-4), pp. 492-500;

Micco, A., Ordoñez, G. and Stein, E. (2003), "The Currency Union Effect on Trade: Early Evidence on Trade", *Economic Policy*, Vol. 18, No. 37, pp. 315-356;

Mongelli, F. P. (2005), "What is european Economic and Monetary Union Telling Us about the Properties of Optimum Currency Areas?", *JCMS: Journal of Common Market Studies*, Vol. 43, No. 3, pp. 607-635;

Mongelli, F. P. (2008), "European Economic and Monetary Integration and the Optimum Currency Area Theory", *Economic Papers 302*, European Commission;

Mundell, R. A. (1961), "A Theory of Optimum Currency Areas", *The American Economic Review*, Vol. 51, No. 4, pp. 657-665;

Mundell, R. A. (1973), "Uncommon Arguments for Common Currencies", in H. G. Johnson and A. K. Swoboda (editors), *The Economics of Common Currencies*, Harvard University Press, pp. 114-132;

Nguyen, T. (2007), "East Asian Currency Area: A Fuzzy Clustering Analysis of Homogeneity", *Developement and Policies Research Center Working Paper No. 10*, Vietnam;

Partridge, M. D. and Rickman, D. S. (2005), "Regional Cyclical Asymmetries in an Optimal Currency Area: an Analysis Using US State Data", *Oxford Economic Papers*, Vol. 57, No. 3, pp. 373-397;

Pasimeni, P. (2014), "An Optimum Currency Crisis", *The European Journal of Comparative Economics*, Vol. 11, No. 2, pp. 173-204;

Quah, C-H. (2011), "Can Japan or China Replace the US as the Monetary Anchor for Hong Kong and Macau?", *Asia Pacific Business Review*, pp. 1-20;

Quah, C-H. (2012), "Is East Asia as Prepared as Eurozone for Monetary Union?", *Journal of Business Economics and Management*, Vol. 13, No. 3, pp. 471-488;

Quah, C-H. (2013), "Potential Currency Areas in East Asia Using United States, Japan or China as the Monetary Anchor", *Economía Mexicana Nueva Época*, Vol. Cierre de Época (I), pp. 247-279;

Quah, C-H. (2016), “A Diagnostic on the West African Monetary Union”, *South African Journal of Economics*, Vol. 84, No. 1, pp. 129-148;

Quah, C-H. and Crowley, P. M. (2010), “Monetary Integration in East Asia: a Hierarchical Clustering Approach”, *International Finance*, Vol. 13, No. 2, pp. 283-309;

Quah, C-H. and Crowley, P. M. (2012a), “China and the Dollar: an Optimum Currency Area View”,*Prague Economic Papers*, Vol. 4, No. 12, pp. 391-411;

Quah, C-H. and Crowley, P. M. (2012b), “Which Country Should Be the Monetary Anchor for East Asia: the US, Japan or China?”, *Journal of the Asia Pacific Economy*, Vol. 17, No. 1, pp. 94-112;

Regmi, K., Nikolsko-Rzhevskyy, A. and Thornton, R. (2015), “To Be or Not To Be: an Optimum Currency Area for South Asia?”, *Journal of Policy Modelling*, Vol. 37, No. 6, pp. 930-944;

Rockoff, H. (2000), “How Long Did It Take The United States To Become An Optimal Currency Area?”, *NBER Working Paper Series*, Historical Paper No. 124;

Rose, A. K. (2000), “One Money, One Market: the Effect of Common Currencies on Trade”, *Economic Policy*, Vol. 15, No. 30, pp. 08-45;

Sato, K. and Zhang, Z. (2006), “Real Output Co-movements in East Asia: Any Evidence for a Monetary Union?”, *The World Economy*, Vol. 29, No. 12, pp. 1671-1689;

Shafighi, N. and Gharleghi, B. (2016), “Feasibility of a Currency Union in East Asia using the Five-Variable Structural Vector Autoregressive Model”, *Economic Analysis and Policy,* Vol. 52, pp. 45-54;

Skorepa, M. (2013), “Troubles in the Euro Area Periphery: The View through the Lens of a Simple Convergence-Sensitive Optimum Currency Area Index”, *Finance a Uver – Czech Journal of Economics and Finance,* Vol. 63, No. 2, pp. 129-151;

Stanisic, N. (2013), “Convergence between the Business Cycles of Central and Eastern European Countries and the Euro Area”, *Baltic Journal of Economics,* Vol. 13, No. 1, pp. 63-74;

Vieira, C. and Vieira, I. (2012), "Assessing the Endogeneity of OCA Conditions in EMU", *The Manchester School*, Vol. 80, pp. 77-91;

Wagner, H. (2014), "Can We Expect Convergence Through Monetary Integration? (New) OCA Theory *versus* Empirical Evidence from the European Integration", *Comparative Economic Studies*, Vol. 56, No. 2, pp. 176-199;

Willett, T. D., Permpoon, O. and Whilborg, C. (2010), "Endogenous OCA Analysis and the Early Euro Experience", *The World Economy*, Vol. 33, No. 7, pp. 851-872;

Zemanek, H. (2010), "Competitiveness within the Euro Area: The Problem that STill Needs to be Solved", *Economic Affairs*, Vol. 30, No. 3, p. 42-47;

Annex

Annex 1 – Data Source Table

Harmonised Index of Consumer Prices (HICP)	AMECO Database
Exports and Imports	UNCTADstat
Gross Domestic Product (GDP)	IMF World Economic Outlook
Product Concentration Indices	UNCTADstat
Output Gaps	AMECO Database
Migration Flows	UN Migrant Stock by Origin and Destination Report
Total Population	UNCTADstat

Annex 2 - EA-19 and Non-EA EU28 members, Annual Inflation Differentials Table

Euro Area	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Austria	0,7	0,2	0,1	0,6	0,8	0,2	0,1	0,5	0,0	0,1	0,1	0,1	0,8	0,1	0,8	1,0	0,8	0,7
Belgium	0,0	0,5	0,0	0,7	0,6	0,3	0,3	0,1	0,3	1,1	0,3	0,7	0,6	0,1	0,1	0,1	0,6	1,5
Cyprus	0,0	2,7	0,4	0,5	1,9	0,3	0,2	0,0	0,0	1,0	0,1	0,9	0,8	0,6	1,0	0,7	1,6	1,5
Estonia	1,9	1,7	3,2	1,3	0,7	0,9	1,9	2,2	4,6	7,3	0,1	1,1	2,4	1,7	1,9	0,0	0,0	0,6
Finland	0,1	0,8	0,3	0,3	0,8	2,0	1,4	0,9	0,6	0,6	1,3	0,1	0,6	0,7	0,9	0,8	0,2	0,1
France	0,6	0,4	0,6	0,3	0,1	0,2	0,3	0,3	0,6	0,2	0,2	0,1	0,4	0,3	0,4	0,2	0,1	0,1
Germany	0,5	0,8	0,5	0,9	1,1	0,4	0,2	0,4	0,1	0,6	0,1	0,5	0,2	0,4	0,3	0,4	0,1	0,1
Greece	1,0	0,7	1,2	1,7	1,3	0,8	1,3	1,1	0,8	0,9	1,0	3,1	0,4	1,5	2,2	1,8	1,1	0,2
Ireland	1,3	3,1	1,6	2,4	1,9	0,1	0,0	0,5	0,7	0,2	2,0	3,2	1,5	0,6	0,8	0,1	0,1	0,5
Italy	0,5	0,4	0,1	0,3	0,7	0,1	0,0	0,0	0,1	0,1	0,4	0,0	0,2	0,8	0,1	0,2	0,1	0,3
Latvia	0,9	0,4	0,1	0,3	0,8	4,0	4,7	4,4	7,9	11,9	2,9	2,8	1,5	0,2	1,3	0,3	0,2	0,1
Lithuania	0,3	1,1	0,9	1,9	3,2	1,0	0,5	1,6	3,7	7,7	3,8	0,4	1,4	0,7	0,2	0,2	0,7	0,4
Luxembourg	0,2	1,6	0,0	0,2	0,4	1,1	1,6	0,8	0,5	0,7	0,3	1,2	1,0	0,4	0,4	0,3	0,0	0,2
Malta	1,1	0,9	0,1	0,3	0,2	0,5	0,3	0,4	1,5	1,3	1,5	0,4	0,2	0,7	0,4	0,3	1,1	0,7
The Netherlands	0,9	0,2	2,7	1,6	0,1	0,8	0,7	0,6	0,6	1,1	0,7	0,7	0,2	0,3	1,2	0,1	0,2	0,1
Portugal	1,0	0,6	2,0	1,4	1,1	0,3	0,1	0,8	0,3	0,7	1,2	0,2	0,8	0,3	0,9	0,6	0,5	0,4
Slovakia	9,3	10,0	4,7	1,2	6,3	5,3	0,6	2,1	0,3	0,6	0,6	0,9	1,4	1,2	0,1	0,5	0,4	0,7
Slovenia	4,9	6,8	6,1	5,2	3,6	1,5	0,3	0,3	1,6	2,2	0,5	0,5	0,6	0,3	0,6	0,1	0,8	0,4
Spain	1,1	1,3	0,4	1,3	1,0	0,9	1,2	1,4	0,7	0,8	0,6	0,4	0,3	0,1	0,2	0,6	0,7	0,6
Other EU28	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Bulgaria	1,4	8,1	4,9	3,5	0,2	4,0	3,8	5,2	5,4	8,6	2,2	1,4	0,7	0,1	1,0	2,0	1,1	1,6
Croatia	2,6	2,3	1,8	0,3	0,3	0,0	0,8	1,1	0,5	2,5	1,9	0,5	0,5	0,9	1,0	0,2	0,3	0,9
Czech Republic	0,6	1,8	2,1	0,8	2,2	0,4	0,6	0,1	0,8	2,9	0,3	0,4	0,6	1,0	0,0	0,0	0,2	0,4
Denmark	0,9	0,6	0,1	0,1	0,2	1,2	0,5	0,4	0,5	0,3	0,7	0,6	0,1	0,1	0,8	0,1	0,2	0,2
Hungary	8,8	7,8	6,7	3,0	2,6	4,6	1,3	1,8	5,8	2,7	3,7	3,1	1,2	3,2	0,4	0,4	0,0	0,2
Poland	6,0	7,9	2,9	0,3	1,4	1,5	0,0	0,9	0,4	0,8	3,7	1,0	1,2	1,2	0,5	0,3	0,7	0,4
Romania	44,6	43,5	32,1	20,2	13,2	9,7	6,9	4,4	2,7	4,6	5,3	4,5	3,1	0,9	1,8	1,0	0,4	1,3
Sweden	0,6	0,9	0,3	0,3	0,2	1,2	1,4	0,7	0,5	0,0	1,6	0,3	1,4	1,6	0,9	0,2	0,7	0,9
UK	0,2	1,4	1,2	1,0	0,8	0,8	0,1	0,1	0,1	0,3	1,9	1,7	1,7	0,3	1,2	1,0	0,0	0,4

Source: Author's calculations on the basis of data from AMECO Database

Annex 3 - EA-19 and Non-EA EU28 members, Annual Trade Integration Table

Euro Area	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Austria	18,53%	20,36%	21,04%	20,68%	21,04%	22,73%	22,78%	24,12%	23,77%	23,31%	19,54%	21,68%	22,89%	21,60%	21,35%	20,81%	20,60%
Belgium	40,73%	46,00%	47,69%	48,80%	48,05%	50,03%	52,20%	54,23%	54,75%	55,35%	46,10%	49,14%	52,07%	51,07%	54,40%	48,58%	46,14%
Cyprus	7,87%	8,38%	8,54%	8,47%	7,71%	9,80%	10,83%	10,52%	11,06%	11,37%	9,90%	10,81%	10,17%	9,57%	9,05%	9,85%	9,90%
Estonia	30,36%	38,25%	34,34%	32,01%	32,58%	31,63%	34,92%	33,74%	31,70%	31,41%	26,85%	30,34%	34,47%	35,61%	35,53%	33,41%	31,54%
Finland	10,21%	11,48%	10,78%	10,03%	10,25%	10,19%	10,53%	11,49%	11,67%	11,29%	8,62%	9,33%	10,19%	8,95%	9,13%	9,39%	9,59%
France	10,08%	11,04%	10,60%	10,37%	10,23%	10,44%	10,67%	11,00%	11,05%	10,94%	9,22%	10,31%	11,03%	10,95%	10,60%	10,38%	10,26%
Germany	10,34%	11,92%	11,54%	11,24%	11,89%	12,72%	13,24%	14,31%	14,88%	14,89%	12,63%	13,65%	14,17%	13,58%	13,24%	13,06%	13,06%
Greece	7,73%	7,20%	6,52%	5,95%	6,87%	6,90%	6,92%	7,20%	7,35%	7,84%	6,55%	6,35%	6,74%	6,64%	6,87%	7,19%	7,49%
Ireland	19,30%	19,54%	18,57%	17,43%	15,23%	14,97%	14,97%	13,78%	13,31%	13,22%	13,51%	13,76%	13,53%	13,67%	12,32%	11,68%	11,93%
Italy	9,46%	10,18%	10,08%	9,62%	9,40%	9,60%	9,66%	10,25%	10,63%	10,11%	8,47%	9,68%	10,21%	10,00%	9,87%	9,96%	10,23%
Latvia	15,47%	16,08%	17,03%	17,59%	18,07%	19,79%	21,42%	22,32%	21,09%	19,47%	17,16%	22,69%	26,59%	27,84%	27,40%	26,20%	25,19%
Lithuania	16,86%	16,44%	17,68%	18,42%	18,21%	21,43%	21,78%	23,47%	23,57%	22,31%	19,22%	23,44%	27,23%	28,42%	27,89%	27,09%	27,29%
Luxembourg	33,02%	34,16%	39,05%	36,05%	39,38%	40,97%	41,05%	41,60%	37,46%	38,82%	33,91%	31,81%	28,76%	29,65%	27,27%	24,13%	25,44%
Malta	28,10%	29,05%	23,36%	23,32%	22,25%	22,13%	21,33%	22,43%	20,50%	17,93%	14,45%	16,33%	17,05%	17,74%	13,98%	11,75%	11,92%
The Netherlands	25,60%	26,08%	25,61%	24,75%	24,66%	27,56%	29,34%	30,97%	31,49%	32,51%	27,63%	31,91%	34,49%	35,41%	34,70%	34,03%	33,87%
Portugal	17,37%	18,17%	17,81%	17,03%	16,66%	17,12%	17,91%	18,98%	19,17%	19,18%	16,36%	17,89%	17,73%	17,64%	19,22%	19,76%	20,08%
Slovakia	26,93%	30,59%	33,16%	33,02%	35,32%	33,34%	31,10%	33,05%	32,82%	31,45%	24,79%	28,19%	31,07%	32,20%	31,78%	32,09%	33,30%
Slovenia	26,21%	28,62%	28,44%	27,16%	26,66%	28,36%	30,06%	32,39%	32,83%	31,39%	25,66%	29,14%	32,23%	32,42%	32,69%	32,44%	32,81%
Spain	12,13%	12,69%	12,51%	11,92%	11,64%	11,73%	11,28%	11,28%	11,58%	10,66%	8,80%	9,63%	10,53%	10,27%	10,68%	11,23%	11,56%
Other EU28	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Bulgaria	16,42%	19,35%	21,48%	21,00%	21,92%	22,72%	22,82%	24,47%	23,28%	22,07%	16,66%	19,63%	23,38%	23,67%	24,86%	25,12%	24,96%
Croatia	15,93%	17,36%	18,29%	17,58%	18,08%	17,33%	16,58%	17,23%	16,63%	16,56%	13,03%	13,55%	14,75%	14,89%	16,97%	18,71%	20,33%
Czech Republic	29,86%	33,28%	34,48%	36,50%	33,37%	36,57%	36,47%	38,13%	38,94%	36,86%	32,19%	36,58%	40,42%	41,29%	41,80%	45,59%	45,73%
Denmark	12,42%	12,71%	13,29%	13,63%	12,84%	12,75%	12,66%	13,30%	13,42%	13,31%	10,85%	11,08%	11,86%	11,60%	11,97%	12,02%	11,94%
Hungary	36,32%	40,53%	37,73%	32,40%	32,22%	35,35%	34,09%	38,41%	39,10%	38,75%	35,06%	38,48%	41,58%	42,91%	42,62%	44,40%	45,50%
Poland	13,26%	13,66%	13,25%	14,11%	16,42%	18,46%	17,58%	18,59%	19,08%	19,05%	17,59%	17,91%	19,28%	18,21%	19,31%	19,92%	20,79%
Romania	15,21%	17,21%	19,20%	19,89%	19,98%	20,44%	17,72%	17,50%	17,38%	16,43%	15,64%	17,55%	19,47%	19,29%	19,06%	19,57%	19,98%
Sweden	12,19%	14,18%	13,30%	13,01%	13,00%	13,54%	14,10%	14,87%	15,18%	15,35%	12,88%	13,47%	14,03%	13,19%	12,50%	12,60%	12,59%
UK	8,83%	9,75%	9,66%	9,51%	9,12%	8,97%	8,87%	10,08%	8,88%	9,27%	8,51%	9,35%	9,91%	9,09%	9,31%	8,94%	8,34%

Source: Author's calculations on the basis of data from UNCTADstat (exports and imports), IMF World Economic Outlook (GDP)

Annex 4 - EA-19 and Non-EA EU28 members, Annual Diversification Indices Table

Euro Area	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Austria	0,07	0,09	0,09	0,08	0,07	0,07	0,07	0,07	0,06	0,06	0,06	0,06	0,06	0,06	0,06	0,06	0,06
Belgium	0,09	0,09	0,10	0,11	0,11	0,11	0,10	0,10	0,10	0,09	0,10	0,10	0,10	0,10	0,11	0,10	0,10
Cyprus	0,32	0,29	0,26	0,19	0,19	0,17	0,24	0,20	0,19	0,21	0,18	0,18	0,20	0,18	0,18	0,19	0,21
Estonia	0,12	0,22	0,18	0,12	0,12	0,14	0,14	0,16	0,11	0,10	0,13	0,12	0,14	0,14	0,11	0,12	0,12
Finland	0,22	0,24	0,22	0,22	0,21	0,19	0,19	0,17	0,16	0,16	0,15	0,13	0,13	0,14	0,15	0,14	0,14
France	0,07	0,08	0,08	0,08	0,08	0,09	0,08	0,08	0,07	0,07	0,08	0,09	0,08	0,09	0,09	0,09	0,11
Germany	0,10	0,10	0,10	0,10	0,11	0,10	0,10	0,09	0,10	0,09	0,09	0,10	0,09	0,09	0,09	0,10	0,11
Greece	0,10	0,12	0,11	0,09	0,09	0,09	0,10	0,12	0,11	0,18	0,16	0,21	0,26	0,34	0,35	0,34	0,25
Ireland	0,20	0,23	0,23	0,24	0,22	0,22	0,22	0,22	0,23	0,23	0,25	0,26	0,26	0,25	0,24	0,24	0,24
Italy	0,05	0,05	0,05	0,05	0,06	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,06	0,05	0,05	0,05
Latvia	0,21	0,21	0,18	0,17	0,18	0,14	0,12	0,11	0,09	0,08	0,08	0,08	0,08	0,09	0,09	0,10	0,09
Lithuania	0,11	0,16	0,17	0,16	0,16	0,20	0,21	0,19	0,11	0,20	0,17	0,19	0,21	0,20	0,19	0,14	0,13
Luxembourg	0,13	0,13	0,13	0,12	0,12	0,13	0,13	0,15	0,15	0,17	0,13	0,13	0,13	0,12	0,12	0,11	0,10
Malta	0,46	0,53	0,45	0,45	0,46	0,48	0,41	0,41	0,39	0,35	0,37	0,43	0,43	0,44	0,42	0,38	0,31
The Netherlands	0,07	0,14	0,13	0,11	0,11	0,10	0,10	0,11	0,10	0,12	0,12	0,12	0,10	0,12	0,11	0,10	0,08
Portugal	0,12	0,11	0,11	0,10	0,09	0,16	0,08	0,08	0,07	0,07	0,07	0,07	0,08	0,08	0,09	0,08	0,08
Slovakia	0,13	0,15	0,13	0,14	0,18	0,14	0,12	0,15	0,17	0,17	0,17	0,16	0,16	0,17	0,17	0,17	0,19
Slovenia	0,11	0,10	0,10	0,11	0,11	0,11	0,12	0,11	0,14	0,15	0,16	0,17	0,16	0,16	0,16	0,16	0,17
Spain	0,12	0,13	0,12	0,12	0,12	0,12	0,11	0,10	0,11	0,10	0,10	0,10	0,10	0,09	0,09	0,09	0,10
Other EU28	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Bulgaria	0,10	0,13	0,12	0,11	0,10	0,11	0,12	0,15	0,13	0,14	0,11	0,12	0,13	0,14	0,13	0,11	0,09
Croatia	0,15	0,14	0,14	0,12	0,12	0,13	0,11	0,12	0,12	0,12	0,09	0,13	0,12	0,10	0,09	0,08	0,07
Czech Republic	0,08	0,08	0,09	0,11	0,09	0,09	0,09	0,10	0,10	0,09	0,10	0,11	0,11	0,11	0,11	0,11	0,12
Denmark	0,07	0,08	0,08	0,08	0,07	0,08	0,09	0,08	0,08	0,08	0,08	0,08	0,08	0,09	0,09	0,09	0,09
Hungary	0,13	0,12	0,11	0,13	0,14	0,16	0,14	0,14	0,14	0,14	0,14	0,14	0,13	0,11	0,11	0,11	0,12
Poland	0,07	0,08	0,08	0,08	0,09	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,07	0,06	0,06	0,06	0,07
Romania	0,13	0,13	0,13	0,14	0,13	0,12	0,12	0,11	0,10	0,10	0,10	0,09	0,09	0,09	0,10	0,10	0,10
Sweden	0,15	0,15	0,12	0,11	0,12	0,12	0,12	0,11	0,10	0,10	0,10	0,10	0,10	0,09	0,09	0,09	0,09
UK	0,09	0,10	0,11	0,10	0,09	0,09	0,10	0,12	0,10	0,11	0,13	0,11	0,13	0,12	0,15	0,11	0,11

Source: Product Concentration Indices available at UNCTADstat

Annex 5 - EA-19 and Non-EA EU28 members, Annual Output Gaps Table

Euro Area	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Austria	0,99	1,70	0,64	0,12	-1,23	-0,67	-0,75	0,49	2,21	2,06	-2,53	-1,53	0,31	0,14	-0,65	-0,84	-0,89	-0,79
Belgium	0,80	1,93	0,40	0,11	-0,97	0,66	0,80	1,43	2,90	1,90	-1,61	-0,23	0,16	-0,73	-1,61	-0,92	-0,55	-0,59
Cyprus	-0,75	1,38	1,67	1,52	0,76	2,06	2,73	3,68	4,93	5,20	1,04	0,52	-0,29	-3,03	-7,07	-6,28	-3,29	-0,82
Estonia	-6,25	-0,88	0,78	1,52	2,88	3,22	6,37	10,96	14,35	5,70	-9,02	-6,58	-0,79	1,83	1,31	1,95	1,02	0,29
Finland	1,72	3,00	1,53	-0,20	-1,31	-0,32	-0,16	1,51	4,47	3,67	-5,11	-2,45	-0,13	-1,59	-2,28	-2,86	-2,74	-1,83
France	0,55	2,29	2,32	1,70	0,80	1,77	1,60	2,29	3,00	1,68	-2,21	-1,32	-0,31	-1,06	-1,37	-1,69	-1,40	-1,28
Germany	0,17	1,47	1,64	0,29	-1,65	-1,72	-2,24	-0,03	1,81	1,63	-4,85	-2,05	0,74	0,40	-0,53	-0,35	-0,16	-0,15
Greece	1,37	1,21	1,32	1,31	2,48	3,63	1,68	4,87	6,30	5,12	0,93	-3,32	-10,01	-14,10	-14,54	-12,39	-11,06	-9,80
Ireland	2,40	3,86	2,40	1,32	-0,53	0,97	2,05	3,87	4,78	-0,48	-4,30	-1,89	-1,97	-3,81	-4,41	0,36	1,62	1,82
Italy	0,05	1,95	2,12	1,08	0,16	0,49	0,64	1,82	2,44	1,18	-3,97	-1,96	-1,33	-2,88	-4,18	-3,81	-2,85	-1,67
Latvia	-0,83	-1,23	-1,29	-0,40	1,47	2,08	4,46	8,43	10,57	2,60	-11,21	-12,21	-5,44	-1,93	-0,16	0,46	1,07	1,62
Lithuania	-2,64	-4,41	-3,73	-3,21	0,88	1,62	3,62	4,93	8,94	6,12	-10,41	-8,93	-4,24	-1,84	-0,33	1,02	0,61	0,82
Luxembourg	2,80	5,89	3,52	3,11	0,67	0,19	-0,62	0,85	5,43	0,87	-5,51	-2,72	-2,66	-5,73	-4,68	-2,62	-2,06	-0,97
Malta	0,09	2,39	-0,18	1,19	1,35	-0,47	0,62	0,07	1,35	2,26	-2,10	-1,32	-2,15	-2,65	-1,94	1,58	2,61	1,62
The Netherlands	1,73	2,61	1,63	-0,69	-2,38	-2,10	-1,57	0,16	2,10	2,07	-2,77	-2,08	-1,23	-2,76	-3,25	-2,52	-1,62	-0,76
Portugal	2,62	3,16	2,28	0,95	-1,39	-0,86	-1,01	-0,32	1,40	1,01	-1,90	-0,06	-1,39	-4,20	-4,37	-3,15	-1,63	-0,62
Slovakia	-1,07	-3,10	-3,67	-3,26	-2,03	-1,24	0,06	2,54	7,13	7,27	-1,99	-0,48	-1,17	-2,10	-2,81	-2,27	-1,25	-0,35
Slovenia	-0,18	0,18	-0,20	0,58	0,26	1,02	1,63	3,57	6,77	6,51	-3,23	-2,61	-2,18	-4,72	-5,62	-3,28	-1,80	-0,39
Spain	1,15	3,10	3,66	3,13	2,58	2,29	2,39	3,04	3,04	1,32	-3,22	-4,26	-5,62	-7,84	-8,73	-7,28	-4,50	-1,79
Other EU28	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Bulgaria	-4,4	-2,8	-2,5	-0,2	0,25	0,48	0,851	1,52	3,27	4,036	-1,89	-1,08	0,2561	-0,399	-0,74	-1,53	-0,77	-0,25
Croatia	NA	NA	-2,1	-1,2	-0,2	0,539	1,492	3,41	6,08	6,22	-1,31	-1,76	-1,493	-3,029	-3,73	-4,36	-3,05	-1,28
Czech Republic	-2,4	-0,2	0,64	-0,2	0,05	0,789	2,429	4,75	5,64	4,396	-2,1	-1,25	-0,377	-1,726	-3,06	-2,12	-0,02	0,217
Denmark	1,54	3,07	2,11	1,1	0,27	1,732	2,8	5,08	4,39	2,307	-3,6	-2,64	-2,146	-2,728	-2,63	-1,9	-1,46	-1,41
Hungary	-1,3	-0,6	-0,4	0,42	0,73	2,064	3,281	4,52	2,91	2,478	-4,43	-3,7	-2,124	-3,882	-2,89	-0,89	0,121	0,212
Poland	1,18	0,72	-2,4	-4,2	-4,3	-2,75	-2,53	-0	2,83	2,746	1,55	1,236	2,073	0,185	-1,35	-1,08	-0,3	-0,29
Romania	-5,4	-5,4	-2,5	0,02	1,67	5,052	4,017	6,15	5,79	7,451	-1,96	-3,96	-3,957	-5,037	-3,31	-2,41	-1,33	-0,08
Sweden	0,52	1,89	0,21	-0,9	-1,4	0,067	0,343	2,42	3,43	0,903	-5,48	-1,35	-0,243	-1,981	-2,47	-1,96	-0,4	0,2
UK	0,58	1,06	0,72	0,19	0,87	0,812	1,314	1,66	2,35	0,29	-4,75	-3,79	-3,242	-2,911	-2,1	-0,44	0,218	0,473

Source: Output Gaps available at AMECO Database

Annex 6 - EA-19 and Non-EA EU28 members, Emigration to EA-19 Table

Euro Area	2000	2005	2010	2015
Austria	2,82%	3,25%	3,25%	3,68%
Belgium	2,62%	2,88%	3,11%	3,25%
Cyprus	3,71%	3,57%	3,31%	3,16%
Estonia	1,76%	2,77%	3,78%	5,85%
Finland	0,76%	0,80%	0,85%	0,89%
France	0,96%	1,06%	1,21%	1,26%
Germany	1,03%	1,28%	1,49%	1,54%
Greece	3,83%	3,19%	2,65%	2,88%
Ireland	1,05%	1,13%	1,17%	1,25%
Italy	2,36%	1,91%	1,81%	1,94%
Latvia	1,62%	2,62%	3,65%	4,15%
Lithuania	1,91%	3,24%	4,52%	4,97%
Luxembourg	5,78%	8,43%	9,52%	9,02%
Malta	0,91%	0,95%	1,18%	1,27%
The Netherlands	1,81%	2,04%	2,37%	2,55%
Portugal	10,89%	8,38%	9,54%	10,56%
Slovakia	1,05%	1,49%	1,95%	2,11%
Slovenia	2,59%	2,87%	3,10%	3,33%
Spain	1,70%	1,22%	1,09%	1,18%
Other EU28	**2000**	**2005**	**2010**	**2015**
Bulgaria	1,45%	3,76%	6,13%	6,53%
Croatia	8,07%	7,86%	7,79%	7,43%
Czech Republic	2,25%	4,47%	6,57%	6,96%
Denmark	0,92%	0,98%	1,06%	0,64%
Hungary	1,48%	2,06%	2,76%	3,06%
Poland	2,60%	4,42%	6,42%	6,79%
Romania	2,56%	6,96%	12,83%	13,38%
Sweden	1,00%	1,08%	1,17%	1,26%
UK	1,08%	1,46%	1,73%	1,72%

Source: Author's calculations on the basis of data from UN Migrant Stock by Origin and Destination